FRIDAY, APRIL 20, 1883.

SCIENCE FOR WORKING-MEN.

A COURSE of four lectures, delivered by members of Johns Hopkins university to the employees of the Baltimore and Ohio railroad, has recently been published for free distribution to the auditors.

As these lectures are simple demonstrations of elementary facts, they have, despite the admirable method that characterizes them, and the excellent illustrations of the text, only an occasional interest to the general public. But they have a very real value in that they mark an effort to accomplish a work of genuine instruction among a class of our people where there is the sorest need of all intellectual help.

These lectures originated, as it were, accidentally, as is the case, indeed, with most good enterprises. This railway company had tried to do something for its people by founding a little library, and starting reading-rooms; with the usual result, — that few of its weary, slow-brained servants could or did make any use of them. Then some one suggested that men too unaccustomed to mental work after daily labor, or too weary for it, might find a lift in lectures such as have long been given in England to workmen of their class: so Professor Martin, with the cordial assistance of Mr. Garratt, the president of the road, devised, with his colleagues, a course of four lectures on subjects which admit of clear demonstration, and which are well within the field of ordinary human experience. How skulls and backbones are made, How we move, On fermentation, Some curious kinds of locomotion, — are all topics which admit of popular treatment, moral-pointing wit, and clever *ad hominem* appeals to awaken the toil-deadened mind. On reading them over, we are not surprised that there were six hundred of the servants of this railway, men and their families, that found pleasure in their hearing.

This good work will, we may hope, give a fresh start to the system of lecturing in this country. We all have seen the rapid decline of the American lyceum lecture, once the most powerful agent of general culture in modern or perhaps all times. Those who have watched the debasements that have attended its decay — the parade of unsavory parsons, vaporing quacks, and offensive rhetoricians — have been driven to wish that this decay might speedily end in death. That part of the American world that profited by the old lyceum system has found its way beyond the stage in its development where such teaching could be of much value. So the platform had to merge itself in the stage, and become a place of exhibition, and not of instruction. Books in the old day were few and dear; libraries did not exist; but now, where any village that of old supported a lyceum has a public library, men and women do better to read a book by a master, rather than hear an hour's talk by any man, however masterful; for the chance is a thousand to one that the essence of any teacher cannot be had in an hour's talk.

But since those primeval days, when a New-England village filled a lecture-room with a keen-witted set of farmers and shopkeepers, the complexion of our American society has changed for the worse. A distinct class of laboring men — men who are ground in the mills and mines until they tend to become mere machines — has grown up in this country, and is increasing at the expense of the farmer and mechanic class. If our system of government has one danger greater than all others, it is to be found in the fact that culture slips by this class. Their habits of life fit them to be the prey of the demagogue; and in such wild outbreaks as the Pittsburg riots we see the natural results of their conditions.

The most important educational problem of our day comes to us from these people; and such essays towards its solution as these Baltimore lectures give us are very welcome, not for what they have really accomplished, but as a possible indication of other and better relations between great corporations and their people.

Gloze it as we may, it is clear that within our modern Commonwealths there has grown

up a set of local governments in the shape of corporations, which hold their employees with a sovereign hand. They are not to blame for the despotism they exercise: that is in the nature of things; nevertheless, this necessary power brings its measure of duties with it. If they will only see, that among those duties which they owe to their subjects is that of giving them help in escaping the evil consequences of their position as far as is consistent with their necessary labor, they will do much to secure their best interests in the future. Considered in a large way, there is no doubt that such efforts as this of President Garratt would prove so immediately profitable, that they could fairly find their way into the balance-sheet of a corporation. The good-will of the dependents of such a principality as a great railway is really a part of its assets; as an insurance against the portentous dangers of grave discontent, it is of inestimable value.

Let us hope that our great corporations will follow this good example, and that in time they will become as powerful agents of intellectual as they have been of economic progress.

THE WATCHMAKING INDUSTRY IN SWITZERLAND.

I have taken advantage of a short stay in this country to learn something of the watchmaking industry. The importance of this branch of manufacture to Switzerland is familiar to all, but not every one has an idea of the national character which it assumes. Locle and Chaux-de-Fonds are two cities an hour's walk apart, containing together between 30,000 and 35,000 inhabitants, with whom watchmaking — or, rather, making the different parts of a watch — is almost the sole business. The business directory is classified into occupations so minute as cutting the figures on watch-faces. The catalogue of individuals or firms who make hands of watches contains, like our own directories, occasional notices of specialties in the manufacture of hands. Special schools of horology are established by the state, in order that nothing may be left undone to save the national supremacy, which has been so endangered by American competition. The result of this competition on the Swiss watch manufacture is a subject worthy of attention from all who are interested in accurate horology.

The general depression produced ten years ago by the competition of the machine-made watches of Waltham and Elgin is well known; but the statements of it were either somewhat exaggerated, or there has been a great recovery. It must be remembered that these Swiss watchmakers were not the unfortunate, half-starved paupers described by some of our American economists, but men, who, by hereditary skill and careful training, had acquired a remarkable proficiency in their art. I have been assured that the best workmen in some of the branches were able to earn as much as a hundred francs a day; and this in a country of most economical habits. Here was a wide margin for retrenchment when the storm came. It was, of course, necessary for the Swiss to cheapen their products; but policy and national pride also urged the better course of improving the quality of their work. Among us, twenty or thirty years ago, Swiss watches were noted for their cheapness rather than their excellence; and, when an American wanted the best kind of a time-keeper, he sent to London or Copenhagen. The Swiss saw that the best way to recover their lost advantage was to apply their skill in doing what machinery could not do, — making a finer finish and more delicate adjustments. In this they claim to have been so successful as to defy competition, having repeatedly won prizes at exhibitions where American watches and their own were placed on trial. How far this claim may be well founded I am unable to say; but the data for judging of the character of the improvement are fortunately at hand, in a state which readily admits of presentation. The observatory of Neuchâtel was established, and an able astronomer (Dr. Hirsch) placed in charge, for the especial benefit of the watchmakers. The best watches and chronometers, to the number of several hundred per year, are here tested, the results published, and prizes awarded to those which fulfil certain conditions. The principal data on which the judgment is based are, —

1. The average difference between the daily rate of the watch on one day and on the day following.

2. The changes of daily rate produced by changes of position. In the severer tests the watch is tried in four positions, — lying flat, suspended in the usual way, handle to the right, handle to the left. The large majority are tested only in the first two positions.

The mean results for some years, in the following table, show how great the improvement which has been made: —

Year.	Mean change of daily rate in a day.	Difference in two positions.
	Seconds.	Seconds.
1862	1.61	–
1863	1.28	–
1864	1.27	8.21
1865	0.88	6.18
1866	0.74	3.56
1867	0.66	3.57
1868	0.57	2.44

From 1868 the improvement, though well marked, is rather slow. The mean result for the three years, 1879–81, is, —

	Sec.
Mean difference between daily rates on two consecutive days	0.53
Difference of rate when flat and vertical	1.84
Sum of the variations in all four positions	8.23

It would be interesting to know how these numbers compare with the corresponding ones for American watches. But in no other country than Switzerland are the public interests so deeply involved that such data are officially published. We know that the Waltham watches, and probably those of all other American factories, are adjusted with the greatest care, to have, as nearly as possible, the same rate in different positions; but we do not know how near they approach precision, nor how they would stand the test after being a few months outside the factory.

After all, the practical question is not so much how good a watch is it possible to make, as how cheaply can you make a watch of the first class. One has long been able to get as good a watch as could be made from Frodsham or Jurgensen by paying from $300 to $500 for it. What the world has gained by the revolution is the ability to command a watch equal, or but little inferior, to the best, at less than half the old price. Here seem to lie, at the present time, the best grounds for the claim of superiority on the part of the Swiss. I am informed that the best anchor escapement watches, such as those whose performance is given in the preceding table, are sold in gold cases for $120, manufacturer's price: this for watches that cannot be exceeded in quality. Can any American company do as well as this?

The Swiss manufacturers have not been slow to avail themselves of the American system of machinery, but I doubt whether they have been able to bring the system to the perfection which it has attained at Waltham. There are two or three great factories on the American plan; but I have not had an opportunity to visit any of them. Owing to the want of steam and water power, and the habit of having the operatives work at home, only such machinery as each man can manage for himself is available at the great centres. Such is the case at Locle and Chaux-de-Fonds. That this is a great disadvantage can hardly be doubted.

A point which the official Swiss tests do not sufficiently consider is the isochronism of the balance under changes of pressure. The Swiss follow the American plan of dispensing with the fusee and chain, and winding up the mainspring from the centre. A great advantage is thus gained in simplicity of structure and freedom from accident; the frequent breaking of the chain, in former times, having been the greatest source of annoyance to the owners of watches. But, if great accuracy of running is aimed at, we now have the disadvantage that the spring acts with greater force when the watch is first wound up, and that the pressure continually diminishes as the watch runs down. The change of rate between day and night thus arising may exceed the variations from all other causes combined. To avoid this difficulty, each balance and hair-spring has to be adjusted by repeated trial; and the perfection of the adjustment should, in all cases, be one of the subjects of any scientific test. This gives rise to an ulterior question, on which I am not quite satisfied. One carries the most perfectly adjusted watch in his pocket for two or three years, and then has to hand it to a watchmaker to be cleaned and oiled. Will the watchmaker be able to put it together again, in perfect adjustment, without spending on it the same time, trouble, and skill which was originally spent by the maker? If this question is to be answered in the negative, it will practically be a waste of labor to perfect the pocket-watch further without re-introducing the fusee and chain. But in these times, when every one who wants accurate time can get it without trouble, an error of a few seconds a day in the running of a watch will be a less evil than the liability to accident from the breaking of the chain. S. N.

Neuchâtel, March 12, 1883.

THE TAGALS OF LUZON.

THE present natives of the Philippines are generally believed to be of Malay origin, and to have been carried there from the Pacific islands involuntarily by the monsoons, or purposely by migration. They have the same form, character, and habits, as the more barbarous branches of the same race, though of more agreeable and manly features. Those of the southern islands look more like Malays than do the Tagals of Luzon, who are more or

less mixed with Chinese, Japanese, and Negritos. In some islands the Chinese, in others the Japanese, type prevails, according to the proximity of these countries.

They are finely formed, of good stature, copper-colored, with abundant straight, coarse,

TAGALS OF THE PHILIPPINES.

black hair, without beard; head well shaped, but flattened behind; forehead moderate, cheeks prominent, nose flattish, face long, and chin narrow; mouth large, with thick lips, strong teeth, and powerful jaws; chest wide; limbs and feet small, though the great toe is abnormally developed, and almost as prehensile as a thumb; the joints very supple.

Nature supplies the Tagal with rice, fruit, roots, and fish; and his skin is his principal garment. He has, therefore, little inducement to work, and, as a rule, does not, unless from necessity, or to buy some gewgaw; then relapsing into his *dolce far niente* under the palms. Their family ties are close, but peculiar in many of their ideas of what we should call propriety. They are trusty servants, good soldiers and sailors, fertile in expedients, using with much skill their natural advantages. They think little of death, beyond a splendid funeral, and, though nominally Catholics, believe in secret in the superstitions of their race. They chew betel, smoke immoderately, and are very fond of cock-fights and lotteries. Their houses are made of bamboo and canes, thatched with the leaves of the nipa palm, and supported on posts. No nails or tools are required for their construction. All the Tagal needs is his *bolo*, or knife; for the materials are growing all around. I know of no race more independent of the industrial arts. His *bolo* is his only essential implement. His spoon, bowl, and basket he finds in the shell of the cocoanut; his basin, plate, and umbrella, in the leaf of the banana; most of his domestic utensils, in the bamboo; his house, mat, hat, in the various palms. His fruit requires no cooking, and his fish and rice only the simplest. If ever there were a child of nature, the Tagal is one.

The Tagals are noted for their skill in weaving the vegetable fibres of their country, and especially those of the pineapple, hemp, bamboo, palms, and reeds. *Jusi* is raw silk; *seda*, spun silk; hemp, *abaca*, *lupis*, and *sinamay*, which are variously combined in the gauze-like tissues for which these islands are famous. How they make such exquisite fabrics with the rude processes at their command is one of the puzzles which the traveller often meets among semi-civilized peoples.

COSTUME OF TAGAL WOMEN.

The Tagals are the most numerous, best known, least barbaric, and most industrious of the races. They speak a dialect of their own, — the mother-tongue of the others, — and number about 1,500,000. The Visayas of the southern islands are possibly more in number. The islands belong to Spain, and, during her three centuries of occupation, have been very poorly developed. Samuel Kneeland.

THE SOLAR ECLIPSE OF MAY 6.

THE members of the expedition for observing the total solar eclipse of May 6, who left New York on March 2, arrived in Callao, Peru, on March 20. At that port they were received by the U. S. vessel Hartford, and sailed on the 22d for Caroline Island, expecting to make the journey in about twenty-five days. Ample time is thus secured for the preliminary work for the contemplated observations.

It is not known yet whether the party will establish themselves upon Caroline or Flint Island. Preference is given to the former, on account of its larger size, and it will be chosen unless it is found that the French astronomers have already located there, in which case the Americans will select Flint Island, that both points may be occupied. The *L'Eclaireur*, the man-of-war which is to convey the French astronomers from Panama, was not in that port when the Americans passed through there.

The two English members of the party, Messrs. H. A. Lawrance and C. Ray Woods, joined the expedition at Panama. They are sent out by the Royal society and the Committee of solar physics, of which Messrs. Lockyer, Stewart, and Stokes are the leading members, and made important observations of the eclipse of last May. These gentlemen come from South Kensington, and have been engaged in spectroscopic work with Mr. Lockyer.

The plans of the party show that spectroscopic observations will be the principal work attempted. An outline of these plans will be of interest.

A spectroscope with a large prism, attached to a $6\frac{1}{4}$-inch telescope, will be used by Dr. Hastings for studying the corona, especially the outer corona. During partial phase the chromosphere will be examined, a grating being substituted for the prism. Mr. Rockwell will observe with a grating spectroscope attached to a $4\frac{1}{10}$-inch telescope, and will note the relative lengths of lines reversed just before totality within a small region of the spectrum. Probably just after this, the grating will be exchanged for a single 60° prism, and an examination made of the limits to which the line 1474 K can be traced. A prismatic spectroscope, which consists of a large 30° prism placed before the objective of a $2\frac{1}{2}$-inch telescope, will be used by Mr. Upton for observing the relative heights and brightness of the hydrogen group, and of other portions of the spectrum. Mr. Brown will use an integrating spectroscope for observing the lines which appear during totality, and the changes which they undergo.

Mr. Lawrance has planned an equatorial stand upon which is mounted a 6-inch objective, having at its focus a grating spectroscope with cameras on each side, for photographing the spectra of the first and second orders. On the same stand is a 6-inch photographic lens, in the focus of which is a spectroscope of low dispersion, armed with a camera. These three cameras will be used to photograph the flash just before and after totality, in order to confirm, if possible, by photography, Mr. Lockyer's eye-observations of last year. He observed the short, bright, chromospheric lines ten minutes before totality began, and, just before totality, the lines which are usually thickened in sunspots, extending as faint lines to a much greater elevation than those of the protuberances. Mr. Woods will employ a siderostat to throw a beam of light upon four instruments, — integrating, analyzing, and prismatic spectroscopes, and a Rowland grating. The photographic plate of the integrating spectroscope is very long, and will be driven by clock-work, in order that, as the portion of the plate illuminated at any given instant is small, the integrated effects that have hitherto been photographed may be differentiated if possible. The grating is provided with cameras on each side, — one to photograph the F region; the other, that more refrangible than H. The prismatic camera was used with great success in Egypt last year. It integrates the light from all parts of the corona; and it is hoped that all the rays, from the violet to the ultra-red, will be photographed. The analyzing spectroscope was also used with good result in Egypt. The plates will be 'red-end' ones, in order to take in all the rays of the spectrum.

In addition to the spectroscopic work, other important observations are planned. Professor Holden will search for intra-Mercurial planets with a 6-inch telescope, and Mr. Preston will use a Savart polariscope attached to a 4-inch or a $2\frac{1}{2}$-inch telescope. Two photoheliographs will be used for photographing the inner and outer details of the corona, under the management of Mr. Lawrance. Observations of solar radiation, of meteorological phenomena, and of the times of contact, will also be made.

After the eclipse, the party is to be conveyed to Honolulu by the Hartford, from which point they will reach San Francisco by the Pacific mail line of steamers. Should there be no delay, intelligence of the results of the expedition may be expected by the middle of June.

W. U.

Callao, Peru, March 22, 1883.

THE FLORIDA EXPEDITION TO OBSERVE THE TRANSIT OF VENUS.[1]

IN selecting the four stations in the northern hemisphere from which to observe the transit of Venus on Dec. 6, 1882, the probable weather at that season, together with the geographical position of the various points considered, were the principal terms in the problem. It was desirable to find points where good weather would be likely to prevail, and where all the contacts, both at ingress and egress, could be seen. Considerable advantage being gained by increasing the distance between the southern and northern stations, those in the United States were chosen as far north as possible, and fulfil the first two conditions.

With these views, the transit of Venus commission selected a point near Fort Selden, New Mexico, San Antonio, Tex., Cedar Keys, Fla., and the naval observatory at Washington. The three southern stations, all between 29° and 33° N. Lat., presented marked differences in their surroundings. The station in New Mexico was about 5,000 feet above the sea, with the air dry and cool. San Antonio has an elevation of about 600 feet, with a dry, warm climate. Cedar Keys is barely above the water of the Gulf of Mexico. In November the weather was hot and comparatively dry, with increasing dampness as the nights became cooler, about the first of December. Washington was chosen because a complete set of apparatus was in working order at the observatory.

The party under my direction was assigned to Cedar Keys, which point we reached Nov. 4. The name Cedar Keys was formerly applied to the whole group of keys between the mouths of the Suwannee and Withlacoochee rivers, but is now used to designate an active business town on Way Key, the largest of the group. This town sprang into existence after the close of the war, and is chiefly interested in the lumber, shipping, and fishing interests, while it is the shipping-point for all the cedar used by the Faber and the Eagle pencil companies, in the manufacture of pencils, etc.

A site for the observing station was selected in a small park at the eastern end of the town; and the construction of the buildings and mounting of the instruments were pushed forward as fast as possible. The so-called soil of Way Key is simply a mass of white sand; and in the grounds of the station, where a pipe well, with a pump, was sunk, the sand existed at a depth of at least fifteen feet.

[1] Abstract of a paper read by Prof. J. R. Eastman before the Washington philosophical society, March 24, 1883.

The buildings for the protection of the instruments were a transit-house, photograph-house, and the building to contain the equatorial telescope; while a small storehouse was built to protect the stores, etc. The principal instruments were a portable transit, a 5-inch equatorial telescope, and a photoheliograph. The first two require no description. The photoheliograph consists of an objective of 5 inches aperture and about 40 feet focus, a heliostat for throwing the sun's rays on the objective, and a plate-holder at the focus of the objective. The objective and the mirror of the heliostat are mounted on the northern pier at northern stations, and the plate-holder is mounted on a similar pier in the photograph-house. The accessory apparatus consists of a measuring-rod, permanently mounted, for accurately measuring the distance from the objective to the photograph-plate; a movable slide, with a slit of adjustable width for exposing the plates; and a circuit connecting with the chronograph in the transit-house, so arranged, that when the exposing-slide is moved to expose the plate, and when the centre of the slit is opposite the centre of the plate-holder, the circuit is broken, and the record made on the chronograph. A black disk is painted on the north side of the slide, and so placed, that when the slide is at rest at one end of its course, and the image of the sun is adjusted concentric with this disk, it will fall on the centre of the plate-holder when the slide is moved. When all the adjustments are made, the exposing of the plates is quite a simple matter. The image of the sun is thrown by the heliostat upon the black disk and centred, the sensitive plate is fixed in the plate-holder, the operator moves the exposing-slide, and the time of exposure is recorded on the chronograph. The plate is now ready to be developed; and here the ablest photographer has an ample field for the exercise of all his skill. The first photographs were made Nov. 23.

The weather was excellent till the last of November, when we had our first norther and a frost, followed by rain and another norther; but Dec. 4 and 5 were clear and mild. At sunset on the 5th, a low bank of clouds was spread along the south-western horizon; but the sky was clear at midnight. On the morning of the 6th, the southern and eastern sky was nearly covered with light cirrus and stratus clouds, with an upper south-west wind, while the surface wind was from the east. All the apparatus was examined, and found to be in good order; and the astronomers went to the equatorial telescope to observe the first contact.

For observing contacts I used an eye-piece magnifying 216 diameters, attached to a Herschel solar prism, and a sliding-shade glass with a density varying uniformly from end to end. The limb of the sun was remarkably steady. The assistant astronomer, Lieut. J. A. Norris, U.S.N., was to take the time of my signals from a mean-time chronometer, while with an observing-key I was to make a record on the chronograph as a check.

About forty seconds before the computed time of first contact, a narrow stratus cloud passed upon the south-eastern edge of the sun, and shut out all the light. The cloud remained about three minutes; and, when it passed off, the notch in the sun's limb was plainly marked. Two photographs were taken to test the apparatus and the plates; and then the time before *second* contact was devoted to an examination of the limbs of Venus and the sun. Both were perfectly steady. In observations of the sun for the last twenty years I never saw it better. At about thirteen minutes after first contact, the outline of the entire disk of Venus could be seen, and seemed perfectly circular. About two minutes later, a faint, thin rim of yellowish light appeared around the limb yet outside the sun. This rim was at first broadest near the sun's limb, but soon the width of the light became uniform throughout. The light was wholly exterior to the limb of Venus; i.e., the black limb of Venus on the sun, and the dark limb outside, formed a perfectly circular disk with the rim of light, or halo, outside the portion off the sun. As the time of second contact approached, Lieut. Norris again took up his station at the chronometer. As the limbs neared geometrical contact, the cusps of sunlight began to close around Venus more rapidly; and the perfect definition of the limbs, and the steady, deliberate, but uniformly increasing motion of the cusps, convinced me instantly that the phenomena attending the contact would be far more simple than I had ever imagined. I had only to look steadily, to see the cusps steadily but rapidly extend themselves into the thinnest visible thread of light around the following limb of Venus, and remain there without a tremor or pulsation. At the moment the cusps joined I gave the signal, and also made the record on the chronograph. Still keeping my eye at the telescope, I saw nothing to note save the gradually increasing line of light between the limbs of the two bodies. The disk of Venus on the sun was black. All the apparatus connected with the photographic work was again examined; and, at about ten minutes after second contact, each member of the party was at his station. Lieut. Norris, who had charge of the chronograph and the heliostat, was stationed at the latter instrument to see that at certain intervals the motion of the heliostat was corrected, and the sun's image thrown in the proper direction. In the photograph-house, the assistant photographer, Mr. G. Maxwell, took each plate from the box, placed it in the plate-holder, called its number, and, after exposure, returned the plate to the proper box. My own share of the work was to record the number of the plate, move the exposing-slide, record the time of exposure of each plate from a chronometer as a check on the chronograph record and as a means of identification, and communicate with Lieut. Norris by a system of signals on the measuring-rod. The chief photographer, Mr. G. Prince, developed the last plate exposed until nearly all the clouds had disappeared, carefully watched all the photographic manipulations, advised in regard to the length of exposure, etc., and prepared and developed, with occasional aid from Mr. Maxwell, all the wet plates used during the day. After the clouds disappeared, measures of the diameter of Venus were made with a double-image micrometer attached to the 5-inch telescope; and then the photographic work was resumed more leisurely. It was intended to use dry plates for all the work; but difficulty in drying the first 150 which were coated, led me to the determination to coat anew only 150 plates, and leave the others to be used as wet plates if the dry plates should unexpectedly fail at the last hour. After eleven o'clock A.M., the clouds disappeared; and, finding we had plenty of time on our hands, we exposed *six* wet plates after each group of twelve dry plates.

At about ten minutes before *third* contact we had exposed 150 dry plates and 30 wet ones. The majority of the dry plates were exposed with a slit 1.5 inches wide, while with the wet plates the width was three-eighths of an inch. On going to the telescope to observe the last contacts, I found the limbs of Venus and the sun as steady as in the morning; and, though there was now some haze over the sun, it did no harm. The third contact was observed with great accuracy, nothing occurring to obstruct or complicate the very simple and definite phenomena which was in the reverse order of that seen at second contact. The rim of light appeared around Venus as soon as the limb was visible beyond the sun, and was seen for nearly ten minutes. The complete outline of Venus was visible for two

minutes later. No phenomena worthy of note were seen between third and fourth contacts. The lapping of the limb of Venus over that of the sun gradually but steadily decreased, until the final separation was observed with great accuracy for such a phenomenon. Soon after the last contact, the entire apparatus was again carefully examined, and the necessary observations made to determine the errors of the chronometers. All the measures were made, also, for determining the exact position of the photoheliograph.

The dry plates were developed in a few days; and 146 dry plates and 30 wet ones were sent to Washington, all of which can be easily measured. Two dry plates were exposed in the forenoon, when the clouds were too dense, and no images were obtained; and two others were accidentally broken.

In the observations of interior contacts there was no trace of any tremor or fluctuation of the light in the cusps, as they closed around the limb of Venus; and it is almost needless to say, that there was no trace of a shadow or a black drop or ligament between the limbs at second and third contacts. The probable error of the second and third contacts was estimated at 0.3s.; for fourth contact, 0.5s.

Observers of transits of Venus and Mercury have written so much in regard to the obstacles encountered from the apparition of the shadow or black drop between the limbs of the two bodies at *second* and *third* contacts, and so full has been the testimony in favor of the existence, and the almost necessary occurrence, of this phenomena, that, at the transit of Mercury in 1878, many observers claimed, as evidence of their skill, that they *did* see it, while others less fortunate apologized for *not* seeing it. Observers of the black drop were so generally confined to those with imperfect apparatus, or to those unaccustomed to observations of the sun's limb or disk, that the true nature of the obstacle was pretty well understood before it was carefully investigated. It is now quite well settled, that the 'black drop' is due to bad eyes, imperfect apparatus, or the inexperience of the observer. With good eyes and proper apparatus, a good observer never should see the black drop: for, when it is seen, there is something wrong; it is a spurious phenomenon.

A TELEPHONIC TIME-TRANSMITTER.

Among the various methods of distributing time, the telephone affords one commendable for its simplicity. Its use for this purpose does not seem to be generally appreciated, and I know of only one contrivance adapted to it other than the one to be described. This one can be called a time-transmitter from its resemblance in appearance and action to the Blake transmitter in ordinary telephones. It is the invention of Mr. C. W. Ruehle of Detroit, and has been in use at the observatory at Ann Arbor for about six months. Its behavior is in every way satisfactory.

Its general character can be seen from the accompanying figures. Fig. 1 is the face view of the transmitter. At *a*, *a* are the binding-

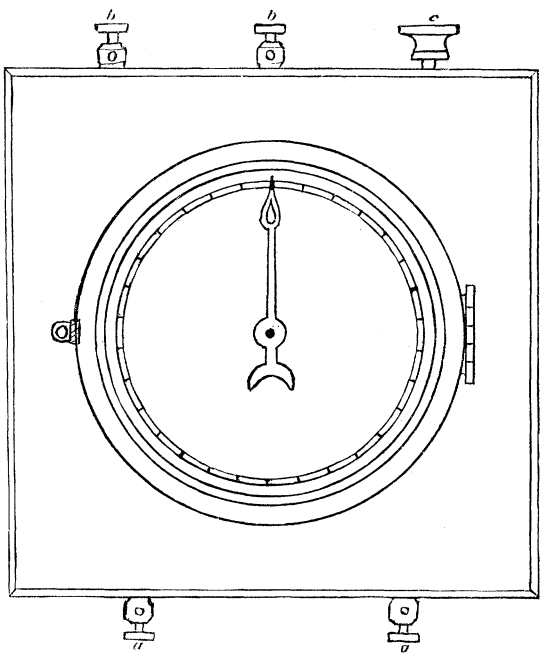

Fig. 1.

posts for the wires from the battery; *b*, *b*, those for the wires of the telephonic circuit. Between the latter is a switch, not represented in the drawing, which enables the operator to cut out the telephone circuit when any thing goes wrong. *c* is a button, by pressing which the instrument can be set going. When started, it runs for two and one-half minutes, during which time the hand in the centre completes a revolution. At the end of that time it stops, and can be started again only by pressing the button.

In Fig. 2 we have a view of the interior. We have here ordinary clock-work, with the addition of a Ruhmkorff coil at *d*, the unlocking part *e*, a circuit-breaker at *f*, and an intermitting-wheel *g*. This wheel moves to the right.

As it turns, the radiating bars on it are brought to a vertical position one after the other; and, while passing this position, they raise the lever suspended above, and, by the action of the pin at its end, keep the circuit open. They are so placed and gauged that they hold the circuit open from 55 to 60 seconds of the first, and then of the second minute.

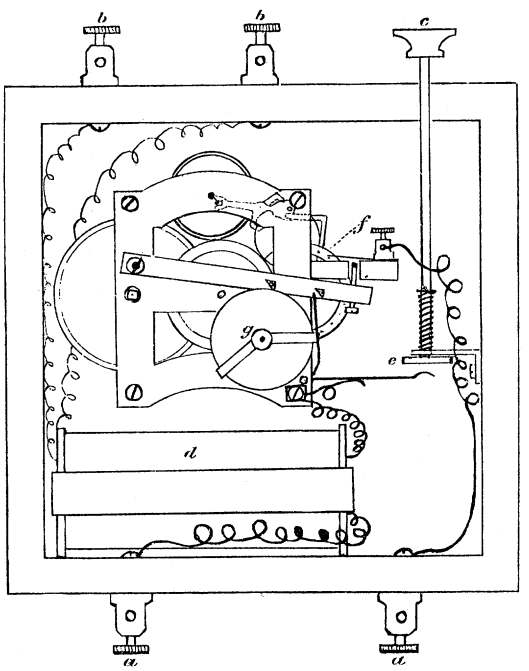

FIG. 2.

Each break in the primary circuit causes a distinctly audible sound in the ear-telephone. This sound is so loud that I have sometimes heard it across the room. As the circuit is broken each second for the first fifty-five seconds of each full minute, and for the full thirty of the last half-minute, the time-transmitter gives a series of seconds signals easily received at any telephone in connection with it. The intermission of five seconds at the end of each full minute serves to notify the receiver that the next minute is about to begin, and thus saves him the trouble of counting.

In using the time-transmitter, the person who desires the time calls me up by telephone, and I start the transmitter at the beginning of some minute by his time. The correspondents are usually jewellers, and do not need to be told the minute at which the transmitter began. If they do need the minute, it can be given them verbally by the Blake transmitter. The succession of beats and intermissions gives the receiver four opportunities for comparison; viz., the beginning of the first, second, and third minute, and the end of two minutes and a half.

An important feature of this method is its capacity for transmitting time to several or many persons simultaneously. In order to test this, Manager Keech of this place obligingly called up all the exchanges connected with us. Some did not respond; but those who did — a dozen or fifteen in number, and distant in all directions from ten to seventy-five miles from us — all heard the beats of the transmitter distinctly, except at Port Huron. From this and some other tests, I concluded, that, by this method, the time could be received by at least twenty-five telephones simultaneously.

M. W. HARRINGTON.

PARENTAL INSTINCT AS A FACTOR IN THE EVOLUTION OF SPECIES.

IN a recent lecture at the Sheffield scientific school, New Haven, the writer called attention to the lack of maternal care as one of the probable causes, though usually overlooked, of the extinction of many of the large and powerful reptiles of the mesozoic age, and of the large mammals of the tertiary. The very small size of the brain and its low organization, in these early animals, are now well known, and we are justified in believing that their intelligence or sagacity was correspondingly low. They were doubtless stupid and sluggish in their habits, but probably had great powers of active and passive resistance against correspondingly stupid carnivorous species. But, unless the helpless young were protected by their parents, they would quickly have been destroyed; and such species might, in this way, have been rapidly exterminated whenever they came in contact with new forms of carnivorous animals, having the instinct to destroy the new-born young of mammals, and the eggs and young of oviparous reptiles.

Thus it would have come about, that the more intelligent forms, by the development of the parental instinct for the active protection of their young against their enemies, would have survived longest, and therefore would have transmitted this instinct, with other correlated cerebral developments, to their descendants. This mode of natural selection must always have been a very active one, wherever carnivorous mammals, birds, and reptiles, have existed in contact with herbivorous species.

Moreover, such Carnivora, among modern species, will also devour the eggs and young of other Carnivora. Therefore the development of equally strong parental instincts in the Carnivora themselves would have come about in the same way. It is evident, that, in this manner, carnivorous animals of comparatively small size may have been the means of exterminating the largest and most powerful beasts and reptiles.

Among nearly all of the existing mammals and birds, the parental instinct is very remarkably developed in one or both sexes, usually more so in the female. Many species, now abundant, would soon become extinct if the parents did not have remarkable sagacity in protecting their young against numerous enemies. Many reptiles, fishes, insects, and still lower forms, also show wonderful maternal instincts. We cannot suppose that their ancient allies had these instincts in the same way, nor to the same extent. In many cases the enemies to be protected against are of comparatively modern origin. New modes of parental protection must, therefore, have been developed or acquired as new enemies appeared. The ways in which different species protect their young are exceedingly varied, as all naturalists know ; and many areas wonderful as any habits known among the lower animals.

The development of the powerful parental instinct for the protection and care of the young, in the earliest races of man, must have been of vital importance in man's struggle for existence in his primitive and comparatively helpless condition.

In fact, it is evident, that without this strong impulse, and the intelligence necessary to make it effective, neither man, nor any of the species of mammals belonging to the higher orders, could have existed, even for a short period.

Possibly the variations in the degree of development of the parental care, in different races of man, may be connected with the increase of some races and the extinction or decline of others. A. E. VERRILL.

LAKES AND VALLEYS IN NORTH-EASTERN PENNSYLVANIA.

H. D. ROGERS, many years ago, pointed out the connection between the lakes and the northern drift in Pennsylvania. In a recent report of the second geological survey,[1] Mr. White gives fuller information on this interesting question, and shows that the numerous ponds north of the Delaware Water-gap (forty-two are enumerated) are generally held in either drift-barrier or drift-enclosure basins, though the depth of some of them seems partly dependent on local erosion in soft shale. The largest is about two square miles in area, and nearly all are less than forty feet in depth. Their shape is generally round or oval; but Long Lake, a narrow expansion of Tunkhannock Creek, three miles long, is an exception to the rule; and, unlike the others, it stands just outside the so-called 'terminal moraine,' or margin of the glaciated area. Glacial action is not regarded as having effected great destructive changes in the pre-existing topography, except in the way of 'pushing or disrupting' rocks that were divided into blocks by joints. The corniferous limestone, especially, has suffered in this way; and its great bowlders, 'many of them as large as a good-sized house,' are strewn beyond its outcrop over a scored and polished surface of cauda-galli grit. It would be interesting to learn if such corniferous bowlders are limited to the glaciated district, and do not occur farther south as a result of simple weathering. All the larger valleys of this region contain modified drift, on which the streams flow without reaching the rocky bottom. In the Delaware and Lehigh valleys, this drift extends far beyond the limits of glacial action; but in the Schuylkill valley, which heads outside of the glaciated area, it is absent altogether (p. xvii.). At and above the Delaware Water-gap, the rocky channel is filled with drift to a depth of probably one hundred feet. All the line of outcrop of the Marcellus shale, from north of Rondout, N.Y., past Port Jervis, where the Delaware joins and flows along it, even beyond Stroudsburg, a distance of ninety miles, is an old, wide, deep valley, buried in stratified drift; but on passing out of the glaciated area, just south of Sciota, some distance after the Delaware turns southward through its gap, the same weak shale is occupied by a valley less than a tenth of its former width. It is therefore suggested that this buried valley was cut by streams under the ice of glacial times.

Narrow post-glacial channels of moderate length, cut in the rock by streams turned from their open pre-glacial valleys by drift-obstruction, are found at several points. The drift-filling of the old Sawkill is as much as three hundred feet deep; and the falls on its new channel are a result and mark of its recent adoption. Raymondskill Falls have the same cause. The Wallenpaupack takes a short cut of two miles, instead of following its old path of four miles, to the Lackawaxen, and, on its new course, has eroded a gorge seventy-five feet deep, ending in falls with a total descent of two hundred and sixty feet in a mile. Above the gorge, the stream meanders for ten miles over a broad, marshy flat, falling only half a foot to a mile, — the final stage of a lake that must have existed in the obstructed valley till the cutting of the gorge drained it. It is very plausibly suggested that all the cascades of this district "owe their origin to a similar diversion of their streams by the drift-dams thrown across their pre-glacial channels;" and we believe that this cause of gorge, ravine and cascade has a very general application in glaciated countries.

The greater part of the report following these introductory pages is devoted to a detailed description of the geological formations of the district.

Mr. Chance's surveys of the Delaware and Lehigh Water-gaps, in the same report, include fine illustration of these notable cross-valleys in contour-line maps and vertical sections; but their description is chiefly geological. It may be noted, that the disloca-

[1] G. 6. Geology of Pike and Monroe Counties, by I. C. White; Special surveys of the Delaware and Lehigh Water-gaps, by H. M. Chance. Harrisburg, 1882.

tion that determines the position of the Delaware Gap is regarded as warping or gentle transverse folding, rather than as a fault, as it has generally been considered (p. 338). The map of glacial striae included in this volume is constructed by Professor Lesley, from Mr. White's observations. It shows a general trend of striae S. 20 to 30° W., but with significant deflections on approaching Kittatinny and Pocono Mountains. A perched bowlder was found on the top of High Knob, 2,010 feet above tide, and glacial scratches were observed on Pocono Mountain at an elevation of 2,150 feet. W. M. DAVIS.

AN APPARENTLY NEW ANIMAL TYPE.

PROF. F. E. SCHULZE, who already ranks so high among zoölogists, has now another claim to distinction, through the discovery of an animal quite different from any thing hitherto known.

The animal was observed in the salt-water aquaria of the zoölogical institute at Graz. It is a thin plate, about 0.02 mm. thick, and only a few millimetres in diameter. It constantly changes its form. It is translucent, and grayish white in color. At rest it is rounded in outline, but may draw itself out into a long thread, which may so curl and twist, that it recalls a Persian or a Turkish letter. The movements are usually so slow as to be barely perceptible, as the animals creep along upon their under surfaces.

Microscopic examination shows that the whole surface of the body is ciliated. Close under the upper surface is a layer of highly refractile balls from 5 to 8 μ in diameter, and distributed pretty evenly. Besides these, there are other balls nearer the under surface, which seem to be essentially different from those first mentioned. There is no indication of internal organs, nor of only bilateral or radiate symmetry: the organism is uniaxial. Schulze names it the ciliated plate, Trichoplax, with the specific name adhaerens, because it clings so closely to the surface on which it is moving.

Such an organism one would expect to find related to the protozoa; far from it, for two different epithelial layers of cells form its upper and lower surfaces, and contain between them a fully developed layer of connective tissue. The upper epithelium is composed of large, flattened, polygonal cells: the lower epithelium, on the contrary, is composed of cylinder-cells, whose outer ends form a mosaic of small polygons, but whose inner ends terminate in processes that are lost in the connective tissue. This last, forming the middle layer of the body, consists of spindle-shaped and branching nucleated cells, which are probably contractile, and are embedded in a hyaline basal substance. The balls above mentioned are contained in large cells. There are, then, three layers, which from their relations would naturally be compared with the ectoderm, mesoderm, and endoderm of other metazoa; but the justification of this comparison must await a knowledge of the development of the organism.

Professor Schulze speculates as to the relationship of this creature, but finds it impossible to assign it to any known class. Although it has been watched for a year, no sign of metamorphosis or of reproduction has been observed; but Schulze thinks it possible that it may have multiplied in the autumn by division.

It seems to me that the animal bears a strong resemblance to a sponge larva. The surmise that it is the young of a porifer may be a useful hint for the further study of this singular form.

The original article is published in the *Zoolog. anzeiger*, no. 132. CHARLES S. MINOT.

THE COLOR-PREFERENCES OF THE HIVE-BEE.

DR. HERMANN MÜLLER, who does not accept the results of Sir John Lubbock's studies of this subject as very conclusive, has himself made a considerable number of observations in the same line (*Kosmos* for Jan.). Though too few to serve as a basis for very broad generalization, they give, so far as they go, a strong degree of proof to several points previously theoretical.

The colors experimented upon were not artificial, but actual floral colors, prepared for use by gumming fresh petals between two ordinary microscope-slides, care being taken that no protruding parts were left, and that the margin was sealed with gum-water, to prevent the possibility of any odor from the petals influencing the bees in their choice.

The bees to be observed were at first accustomed to visit uncolored slides, smeared with honey, exposed close by their hive, and gradually removed, in the course of several days, to a distance of twenty-six metres, where they were replaced by two slides of the colors to be compared, similarly smeared, and placed one decimetre apart. Each bee was marked on its back with an oil-color, by which it was recognized on its different visits. It was found later, that bees from distant hives, if caught on flowers a few steps from the place of observation, and transferred to the honeyed slides under a tumbler that had been sweetened in the same way, usually returned regularly.

In the different observations a number of marked bees were employed, both as a means of economizing time, and to compensate for the somewhat different preferences of individual insects. To eliminate the influence of location, the positions of the slides under observation were changed from time to time.

The general results reached are as follows: —

Leaf-green is less attractive to bees than the colors usually found in flowers adapted to pollination by them.

The colors of these, which may be conveniently called bee-flowers, are, without exception, preferred to fulgent colors, like the yellow of buttercups and the scarlet of some poppies, which usually occur in flowers open to a mixed circle of visitors, or adapted to humming-birds. The extent of their choice in each case may be seen from the annexed table; the figures indicating the relative number of visits, on a basis of 1,000 to each bee-flower color. (Table I.)

Fulgent colors are less attractive to bees than the neutral tint which precedes them in the development of the flower.

Bright yellow is less distasteful than other brilliant colors, but it is least acceptable of the colors found in bee-flowers. (Table II.)

Yellowish white and white are at least as attractive to Apis as many shades of purple, but less so than blue and violet. (Table III.)

Blue is preferred to the red of bee-flowers, or is at least equally acceptable, in the shades tested. Pure deep blue is even more attractive than violet. (Table IV.)

With the exception of blue, violet is more attractive than other colors experimented with. (Table V.)

Red, in the shades found in bee-flowers, constantly surpasses only yellow in its attractiveness for the hive-bee. It is equalled or surpassed by all other colors used for comparison. (Table VI.)

TABLE I.

Fulgent colors.	Bee-flower colors.	
Bright yellow (Ranunculus)	Honey-yellow (Diervilla)	615 : 1000.
" " "	White (Calystegia sepium)	437 : 1000.
" orange (Calendula)	Rose (Rosa centifolia)	310 : 1000.
" " (Esscholtzia crocea)	" " "	338 : 1000.
Red (Tropaeolum)	Violet (Viola tricolor)	362 : 1000.
Scarlet.	*Rose-color.*	
(*a*) Papaver rhoeas	Rosa centifolia	164 : 1000.
(*b*) Canna	" "	472 : 1000.
(*c*) Pelargonium	" "	530 : 1000.
Scarlet (Papaver rhoeas)	Pink-red (Dianthus armeria)	493 : 1000.
" " "	Blue (Centaurea cyanus)	167 : 1000.

TABLE II.

Yellow of bee-flowers.	Other colors of bee-flowers.	
Yellow (Potentilla anserina)	Purple (Trifolium pratense)	1000 : 1476.
	at first	1000 : 2250.
	later	1000 : 1000.
Golden yellow (Viola tricolor)	Yellowish white (Viola tricolor)	1000 : 1971.
Deep yellow (Oenothera glauca)	Indigo-blue (Aconitum napellus)	1000 : 2000.
Yellow (Helianthus annuus)	Pink-red (Silene armeria)	1000 : 2741.
Golden yellow (Viola tricolor)	Violet (Viola tricolor)	1000 : 3250.
Chrome-yellow (Paper)	Cobalt-blue (Paper)	1000 : 3636.

TABLE III.

Yellowish white and pure white.	Other colors of bee-flowers.	
Yellowish white (Viola tricolor)	Golden yellow (Viola tricolor)	1000 : 507.
White (Lathyrus odoratus)	Dark purple (Lathyrus odoratus)	1000 : 757.
Yellowish white (Lamium album)	Purple (Lamium maculatum)	1000 : 942.
" " (Viola tricolor)	Blue (Viola tricolor)	1000 : 1214.
" " " "	" " "	1000 : 1388.
White (Paper)	Sky-blue (Borago officinalis)	1000 : 1777.
Yellowish white (Viola tricolor)	Violet (Viola tricolor)	1000 : 2181.

TABLE IV.

Blue.	Other colors of bee-flowers.	
Cobalt-blue	Chrome-yellow	1000 : 275.
Indigo (Aconitum napellus)	Yellow (Oenothera glauca)	1000 : 500.
Violet (Geranium pratense)	Impure dark purple (Symphytum officinale)	1000 : 541.
Sky-blue (Borago officinalis)	White (Paper)	1000 : 562.
Pansy-blue (Viola tricolor)	Yellowish white (Viola tricolor)	1000 : 720.
Deep pansy-blue	Violet (Viola tricolor)	1000 : 700.
" " "	" " "	1000 : 826.
Sky-blue (Borago officinalis)	Bright purple (Geranium sanguineum)	1000 : 800.
" " "	Violet (Viola tricolor)	1000 : 877.
" (Echium)	Rose-color (Echium)	1000 : 947.
" (Borago officinalis)	" " (Rosa centifolia)	1000 : 1000.
Corn-flower blue (Centaurea cyanus)	Purple (Rosa)	1000 : 1000.
Violet-blue (Lathyrus odoratus)	Dark purple (Lathyrus odoratus)	1000 : 1000.
Pansy-blue, with some transmitted yellow	Pansy-violet	1000 : 1243.

TABLE V.

Violet.	Other floral colors.	
(Viola tricolor)	Golden yellow (Viola tricolor)	1000 : 308.
" "	Yellowish white (Viola tricolor)	1000 : 458.
" "	Purple (Rosa)	1000 : 698.
" "	Blue, with some transmitted yellow (Viola tricolor)	1000 : 804.
" "	Sky-blue (Borago officinalis)	1000 : 1140.
" "	Deep pansy-blue (Viola tricolor)	1000 : 1209.
" "	" " " " "	1000 : 1428.

TABLE VI.

Red of bee-flowers.	Other colors of bee-flowers.	
Pink-red (Silene armeria)	Yellow (Helianthus annuus)	1000 : 365.
Purple (Trifolium pratense)	" (Potentilla anserina)	1000 : 677.
Pure purple (Rosa)	Corn-flower blue (Centaurea cyanus)	1000 : 1000.
Dark purple (Lathyrus odoratus)	Violet-blue (Lathyrus odoratus)	1000 : 1000.
Rose-color (Rosa centifolia)	Sky-blue (Borago)	1000 : 1000.
" (Echium)	" (Echium)	1000 : 1055.
Purple (Lanium maculatum)	Yellowish white (Lanium album)	1000 : 1061.
Bright purple (Geranium sanguineum)	Sky-blue (Borago)	1000 : 1256.
Dark " (Lathyrus odoratus)	White (Lathyrus odoratus)	1000 : 1321.
Pure " (Rosa)	Violet (Viola tricolor)	1000 : 1432.
Impure dark purple (Symphytum officinale)	Violet-blue (Geranium pratense)	1000 : 1848.

W. TRELEASE.

LETTERS TO THE EDITOR.

[*Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*]

United States geologists, sandstones, and the Keweenawan series.

HAVING objected to certain current views in geology and lithology, especially those of one of the preceeding U. S. geological surveys, it is with great pleasure I observe that some of the officers of the present U. S. geological survey, in recent publications, take concordant grounds, in several points, with those published by myself between 1877 and the summer of 1880. These are: 1°. The necessity for the essential union of field and microscopic work, the former to dominate in points relating to the origin of rocks, from the inability of the latter to do what it was claimed it could; and as a reaction against the present too exclusive sedimentary theories; 2°. That propylite has no existence as a rock species, but is an altered state of other rocks (principally andesite), its erection into a distinct species being due to erroneous microscopic and other observations; 3°. That the conglomerate beds of Keweenaw Point are formed in the main from the *débris* of granitic and old rhyolitic and trachytic rocks (the basaltic *débris* is subordinate).

Apropos of Mr. G. P. Merrill's letter in SCIENCE, No. 8, it is proper to state, that, since sandstones are detrital rocks, the minerals contained in them would of necessity have the same inclusions as they had in the rocks from whose detritus the sandstones are formed; and that it has long been known to lithologists, and fully published in the past, that the quartz of sandstones contains fluid inclusions (both with and without moving bubbles), glass inclusions, trichites, etc.

Owing to some remarks in the same number, it is necessary to add somewhat to my previous letter upon Keweenaw Point geology. The evidence advanced by Logan, which Dr. Hunt finds so convincing, was mainly a difference in dip between the traps and sandstones when several miles apart; and all the evidences, as Logan says, only "seem to support the suspicion that the sandstones may overlie unconformably those rocks, which, associated with the trap, constituted the copper-bearing series." The 'Keweenawan series' was first founded on observations on Keweenaw Point; and it, of course, is to live or die there. The observations mentioned in my previous letter are clear, definite, and positive, and substantiate the views of Whitney, Selwyn, and Winchell. They include and explain those of the Michigan and Wisconsin geologists on which the series was based; and, until they are disproved, they definitely show that the Keweenawan series has no separate existence, but overlies, and is continuous with, the eastern sandstone. Dr. Hunt's argument is based on the dictum that the traps underlie the eastern sandstone; and hence his argument is void. Over two years ago the attention of Messrs. Selwyn, Hunt, Irving, and Winchell was called to my observations; and, until they disprove them, it is difficult to see why they should ignore them, and enter upon an interminable theoretical discussion regarding a series which those observations showed did not exist.

Cambridge, Mass., April 3, 1883. M. E. WADSWORTH.

The Ainos of Japan.

A note in SCIENCE of March 30, on the Ainos of Japan, seems to call for a word of comment. A residence of four years in the Island of Yesso, in the capacity of a government official, threw me in almost daily contact with the Ainos, and presented opportunities for studying this most interesting people, which enable me to speak with some degree of assurance concerning them.

That the Ainos of Japan have no race affinities with the Japanese is not to be denied: in fact, all authorities upon the subject, especially those who have studied the people in their own home, are unanimous upon this point. It would seem, however, that, with regard to the Aino population, there is a diversity of opinion, which makes glaring discrepancies in the records given. Having personal acquaintance with some of the authorities which Dr. Brauns cites, — i.e., the missionaries of Hakodate, — and having had abundant opportunity to verify the government statistics by inspection of Aino settlements in various parts of the island, I cannot but feel justified in the statement that the figures given by Dr. Brauns, and so often stated at random by others, are far too large. Statistics compiled for me from the government records show the following population, by provinces: —

PROVINCE.	Male.	Female.
Chisuma	237	223
Hitaka	2,561	2,709
Iburi	1,889	1,837
Ishicari	532	526
Kitami	635	614
Kushiro	732	717
Nemuro	229	244
Oshima	125	120
Shiribeshi	450	407
Teshiwo	186	166
Tokachi	740	758
Totals	8,316	8,321
Grand Total	-	16,637

The province of Chisuma includes all of the Kurile Islands, while the other provinces are embraced in the Island of Yesso. Of the 1,058 Ainos in the province of Ishicari, 750 were brought from Saghalien when that island was ceded to Russia in exchange for the Kuriles, about the year 1876, and are those spoken of by Mr. Brauns as found near Sapporo. With regard to the number of Ainos found on the Asiatic continent, no reliable statistics are to be found; but it is probably large.

The tribute which Mr. Brauns pays to the Aino character is certainly worthy of indorsement; and it would be a pleasure to add to what he says, were it not that want of space forbids, and that these facts will shortly appear in a more permanent form, as they are embodied in a book now nearly ready for the publisher. It only remains to add, that, while the figures given are undoubtedly very near the true population of the various Aino settlements, they cannot be taken as more than closely approximate.

D. P. PENHALLOW.

Houghton Farm, Mountainville, N.Y., April 2, 1883.

PREHISTORIC TREPHINING.

On prehistoric trephining and cranial amulets. By ROBERT FLETCHER, M.R.C.S. Eng., Act. asst. surg. U. S. army. Washington, *Government printing-office*, 1882. 32 p., 9 pl, cuts. 4°.

THIS brochure, which is a part of vol. v. of the Contributions to North-American ethnol-

ogy, gives in a very compact form the facts obtained in regard to the practice of trephining among prehistoric races.

The first communication on the subject was made by Broca in 1877. His attention was directed to certain crania, belonging to the age of polished stone, presenting curious losses of substance not to be explained by the action of weathering. What, then, was the cause of this, and what its object? Pathological anatomy and experiment might answer the first of these questions quite conclusively, while the second lies within the realm of speculation only.

The skulls in question usually had holes in them, the edges of which were partly sharp, rough, and irregular, and partly smooth, eburnated, and slightly bevelled. In a few the latter condition alone was present. The smoothed edges were evidently the result of cicatrization, the diploetic portion having been replaced by a compact, bony structure, thus giving the ivory-like character. Such a process could only have taken place during the life of the individual. Congenital deformity, disease, or injury were the causes which could have given rise to a loss of substance of this sort. The first two are easily excluded for reasons which would at once be accepted as valid by those who have studied the changes produced in bones under such circumstances. An injury, then, remains to account for this; and such can be accidental or intentional. Of the former sort those received in battle are the most common; and had the people of the neolithic time been armed with sharp, cutting weapons, the occurrence of these wounds might have been referable to them. A calvaria in the Musée Broca exhibits a somewhat similar condition, a slice having been removed by the blow of a Tartar sabre. But the weapons of this people were chiefly axes or hammers, which would produce depressed fractures, usually accompanied by a greater destruction of the inner than the outer table of the skull, — the opposite of what had taken place here, as shown by the bevelling.

The theory which explains the condition best is, that a portion of the skull had been removed by scraping or drilling through it. This would naturally give an oblong hole with a bevelled margin. The bone in the immediate neighborhood being healthy, and all signs of re-active inflammation having passed away, it is probable that the operation must have been done long before the death of the individual, and presumably in childhood. Broca demonstrated that a child's skull could be easily scraped through in a few minutes, with the aid of a piece of flint, and that an adult's could be perforated in an hour. A puppy was also experimented upon in the same way by him; and it was found that the operation was well borne, and the animal made a good recovery. In man this rude method of trephining is not necessarily fatal, as there are savage tribes in the South Seas and in Algeria which practise the operation in precisely the same way, with a good percentage of recovery.

This being accepted as the cause, what can have been the object of the operation? Among civilized people the operation is performed to remove diseased or depressed pieces of bone giving rise to symptoms of compression. M. Parrot has exhibited one skull which he thinks shows such was the case. There is no doubt of the evidence of disease; but it does not seem to be clearly shown that this may not have arisen subsequently to the trephining, and entirely independent of it. Among the savage tribes already referred to, the relief of epilepsy is assigned as the reason for the operation; and this is a plausible explanation of its use among prehistoric races.

It will be remembered, that, in the greater number of trephined skulls, the edges of the opening were partly rough and jagged. Such were evidently made after death, as there is no evidence of any attempt at repair; and it is conjectured that pieces of bone were then broken away so as to include a portion of the original cicatrized margin, and that these were subsequently worn as 'amulets.' This is called post-mortem trephining.

The western hemisphere has thus far furnished but one case of trephining among prehistoric people. It was discovered by Squier in an ancient Peruvian. A square piece of bone had been removed, apparently by cutting, and the patient, an adult, had survived but a short time, — fifteen days, according to Nelaton.

The thanks of American investigators are due to Dr. Fletcher for placing within their reach such a well-illustrated *résumé;* and its careful perusal will certainly repay those interested in the subject.

REPORT OF THE PEABODY MUSEUM.

Fifteenth annual report of the trustees of the Peabody museum of American archaeology and ethnology. Vol. iii, no. 2. Cambridge, 1882. [106] p. 44 fig. 8°.

THIS report is chiefly devoted to notes by the curator upon the copper objects from North

and South America contained in the collections of the museum.

The extent to which copper implements were disseminated among the aboriginal tribes of America will be surprising to many. The ornaments and implements lucidly described by Mr. Putnam are from places as widely separated as the burial-fields of Maine, Vermont, Massachusetts, and the mounds of the central and south-western states; besides a fair representation from Mexico, Central America, and Peru. In fact, objects made of copper are as widely distributed in America as are the stone implements of neolithic forms. This, however, does not imply that the same stage of advancement had been reached by copper-using tribes all over this territory. In Mexico, Central America, Peru, and Chili, copper ornaments and implements were cast, and then finished by hammering. Mr. Squier reports remains of furnaces in the ruins of Chimu, where, in early times, copper ores were smelted. In Mr. Putnam's opinion, there is no evidence that copper was ever cast in moulds by the aboriginal tribes of the United States; but native copper was hammered by them, as these cuts show, into innumerable shapes. Figs. 3 (here reproduced), 10, and 11 represent cruciform copper ornaments; but this seems to be a design of natural conception, rather than a symbol of Christianity, as some have supposed. The Sioux draw a figure of the cross to signify the four winds.

CRUCIFORM PENDANT FROM A STONE GRAVE IN TENNESSEE.

Besides the above notes, the report contains, among other things, a brief account of the important exploration now in progress under the auspices of the museum, of an extensive ancient cemetery at Madisonville, near Cincinnati.

The institution needs a great increase of its funds to equip it for its pressing work. Civilization is fast destroying all vestiges of prehistoric races. The science of the whole world and of all time will be enriched by any enlargement of the Peabody museum.

THE PANTHER CREEK COAL-BASIN.

Second geological survey of Pennsylvania. J. P. LESLEY, state geologist. *Anthracite district*, CHARLES A. ASHBURNER, geologist in charge. *Panther Creek basin*, [*in*] *Carbon and Schuylkill Counties*, 10 sheets [vertical sections, 3 sheets; horizontal sections, 3 sheets; map of the mines, 3 sheets; diagram of surface-area, 1 sheet]. — *Topographical map of the Panther Creek coal-basin*, 1 sheet. — *Preliminary map anthracite coal-fields*, 1 sheet. — *Production anthracite coal-fields*, 1 sheet. In all, 13 sheets, 605×725 mm. 1882.

THE constantly increasing use of cartographic and diagrammatic methods in illustration is an evidence of a most healthy advance in thoroughness and accuracy in geological work in this country. It is only within a comparatively few years that any trustworthy topographical maps at all have been available for our geological workers; and even now, outside of those made by government surveys in the west, they cover but a very small proportion of the area of the United States.

The theoretical as well as practical value of a geological map is directly dependent upon the accuracy and detail of its topographical basis; and, no doubt, many bitterly disputed questions which came up in earlier geological work in this country, some of which are still unsettled, would not have arisen, had it been possible to carry on the work originally on a systematic basis, instead of by individual observers who had not the advantage of comparing notes in the field, and who had either no map at all, or such as, from want of accuracy and detail, would be comparatively worthless. For practical purposes, such as the development of mineral deposits, the theoretically perfect map should contain in itself all the necessary data; so that no text would be required as an aid to its use in exploration, this being employed simply for explanation of methods of work and for theoretical deductions.

The thirteen charts now before us, recently prepared by Mr. Charles A. Ashburner, geolo-

gist in charge of the anthracite division of the Second geological survey of Pennsylvania, are a very close approach to this theoretical perfection. They are devoted to the illustration of the Panther Creek coal-basin, the north-eastern portion of the southern anthracite field, included between the Little Schuylkill River on the west, and Mauch Chunk on the east. Of these charts, one sheet gives the reproduction of a topographical map of the basin, made by Mr. R. P. Rothwell in 1869, on a scale of 1,600 feet to the inch, with contour-lines at vertical intervals of 10 feet. Three sheets, forming but one map, show the shape of the floor of the mammoth coal-bed, on a scale of 800 feet to the inch. This is practically an underground map; and in it Mr. Ashburner has introduced the somewhat novel system of representing the shape of a certain bed in the basin by contours, in the same manner as the surface of the ground is represented in our grade-curve maps. These underground curves are printed in red, and are drawn at 50-feet vertical intervals; some of the prominent surface features, such as railroads and important buildings, being printed over them in black.

It seems a pity that Mr. Rothwell's map should not have been published on the same scale, so that it might be superposed upon the underground map; thus showing, at a glance, the difference between surface and underground topography. Such a map shows at once the shape of the basin, and, by the relative closeness of contour-lines, the angle of dip at any point; and from it may be constructed an actual section of the coal-basin on any given line. Twelve of such sections are actually constructed at favorable points, and represented on three other charts on a scale of 400 feet to the inch. They are also given on the same charts on a scale of 1,500 feet to the inch, drawn one under the other, so as to represent more graphically the general shape of the various folds, and the position of the underlying rocks. They are accompanied by a sketch-map of the whole basin on a scale of 2,300 feet to the inch.

On still three other sheets are given columnar sections, representing the thickness of the coal and intervening beds at a number of different points where they have been determined, constructed on various scales, from 10 feet to 300 feet to the inch. One of these sheets also contains a skeleton map of the basin, showing the locality of these sections as well as of the cross-sections.

Furnished with these maps, the mine-owner can tell at what distance a shaft or tunnel may reach the coal-bed from any given point, and the inclination of such bed when reached. He can determine the proximate line of the bottom of the various synclinal basins along which he wishes to run his galleries, and which coal from the various breasts may reach by gravity.

Of the three remaining sheets of the series, one gives a diagram showing, in different shades of color, the area of the respective coal-beds, developed on a horizontal plane; the second, a skeleton map of the entire anthracite region on a scale of $\frac{1}{300000}$, with columnar sections showing the local names of the various coal-beds in different parts of the region, and the names of all the collieries. The third sheet shows the production of anthracite coal, from its earliest development to the present day, both in columns of figures from different districts, and in curves forming a pyramidal diagram for the total product; also some brief historical notes.

The sheets are 26 by 32 inches in size, and are engraved by the reliable firm of Julius Bien & Co. They bear evidence of an immense amount of accurate detail-work; and the only serious criticism we have to make, is the use, by Mr. Ashburner, of the magnetic instead of the true meridian.

The practical value of such maps as these, where underground developments have been carried on to a sufficient extent to furnish data which will make their deductions trustworthy, must be evident to the most untechnical; and that it has been appreciated by the mine-owners of the anthracite region is proved, not only by the practical aid they lent to the work by furnishing all their surveys and measurements, but also by their contributions of money to help defray its expenses. They form a highly instructive lesson of the practical value of a properly conducted geological survey, and one to which the legislators of Massachusetts and Rhode Island would do well to turn a listening ear; for it is certainly a disgrace, in these enlightened times, that they have within the borders of their states a coal-basin of which less is known than of those of the wild, almost uninhabited, regions of the Rocky Mountains.

THE SMITHSONIAN PUBLICATIONS.

Catalogue of publications of the Smithsonian institution, 1846–82, with an alphabetical index of articles. By W. J. Rhees. Washington, *Smithsonian institution*, 1882. 14+328 p. 8°.

A preface states in a general way what the institution has published, the rules for distribu-

tion, and the prices of those numbers which are sold. A detailed chronological list of the 496 issues is then given, followed by a classified list under 29 heads, with some subdivisions, and, finally, by an alphabetical index to the Contributions, Miscellaneous collections and Reports of the Smithsonian, the Bulletins and Proceedings of the National museum, and the First annual report of the Bureau of ethnology. Thus every inquiry that will probably be made is answered beforehand. Is my set complete? Is this volume perfect? What articles are there in this department of science? In what volume or volumes has this man written? In what is this subject treated? How can I get them? How can I procure a set, or get the volumes as they are issued? Indeed, if one must be critical, we should say that answers are provided for some questions which only an idiot could be expected to ask. In the index, not only are references made from the names of the authors, and from the subjects of articles, but from the first words of their titles, however insignificant they may be. Thus we have such entries as *Contributions* to history of fresh-water algae, *Criticisms* of Dr. J. Hahn, *Hints* on public architecture, *Knowledge* of cryptogamous plants, *Means* of destroying the grasshopper, *Method* of preserving lepidoptera, *Narrative* of the Hassler expedition, and scores of others just as unworkmanlike as these, — entries that would make the Index society stare and gasp. In an ordinary book this might be overlooked; but it is unworthy of one which is intended to be one of the monuments of the scientific achievements of our country. It is true, these articles are all indexed in their proper places also; so that the fault is, at worst, one of surplusage. We have seen indexes in which entries were made under *A* and *The*, and there only. Mr. Rhees has not reached this length of absurdity. He may urge that there are people who will look for the articles under the words to which we have objected. It is difficult to over-estimate the mental left-handedness of mankind, but Mr. Rhees is addressing a scientific public. We should be sorry to believe that their training had produced no better habits of thought than he seems to anticipate.

WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

ASTRONOMY.

Spectroscopic observations of the transit of Venus. — Tacchini at Rome observed the first and second contacts by means of the spectroscope, in the manner first proposed by Young in 1869. He saw the external contact 54 seconds earlier than his colleague Millosevisch, who observed with a telescope in the ordinary way: the second contact (internal) he observed 36 seconds earlier. A discussion shows that the spectroscopic observations are superior in accuracy to the telescopic. An attempt was made to observe the contacts at Palermo in the same way by Riccó, but it failed. At the moment when the planet left the chromosphere, and its atmosphere was on the slit of the spectroscope, both Tacchini and Riccó saw, for a fraction of a second, one or two bands between B and C, which could only have been caused by the planet's atmosphere. — (*Mem. spettr. Ital.*, Dec., 1882.) C. A. Y. [636

Observations of the lunar crater Plato. — A comparison by A. Stanley Williams of a large number of observations taken by himself and others in 1879–82 with a similar series taken in 1869–71 seems to give evidence of change in this crater. Of thirty-seven spots seen in the crater in 1869–71, six were not seen in 1879–82; while seven, not seen during the first period, were seen in the second. The mean visibilities of most of the spots observed in both series agree very closely, but eight show a decided variation in brilliancy. Among the light streaks in the crater, some change was noted, particularly in one which was not seen at all during the first twelve months of the first period, and is now larger and brighter than others previously seen. [This paper is to be continued.] — (*Observ.*, March 1.) M. McN. [637

MATHEMATICS.

Transformation of surfaces. — Professor Enneper, in this article, has reproduced the substance of two previous articles which he has written upon the same subject, with a number of additions. The particular transformations treated of are defined as follows: the corresponding points P and P_1 of two surfaces S and S_1 are so related to a fixed point O, that the plane through the points O, P, and P_1 contains the normals to the surfaces S and S_1 in the points P and P_1. Among other derived surfaces coming under this head are the pedal and negative-pedal surfaces, inverse surfaces, etc. A generalization of Malus' theorem is given; viz., the surface separating two homogeneous media is regarded from a given point O; at a point P of the surface, the ratio of the sines of the incident and reflected rays is a function of the distance O P: the reflected rays are then the normals to a certain surface and its parallel. The author discusses the problem of finding when lines of curvature upon the given surface S correspond to lines of the same kind upon the derived surface S_1. The results in this case are tolerably well known. — (*Math. ann.*, xxi. 1883.) T. C. [638

Geodesic polygons. — The results obtained by the author, Otto Staude, in this paper, are for the most part known; but his method seems to be entirely new. M. Staude attempts, in a measure, to do for quadric surfaces, by aid of hyperelliptic functions, what has already been done for conics by the aid of elliptic

functions. He limits himself to the examination of geodesic polygons traced upon central surfaces of the second degree. Section 3 of the paper is an excursus upon the thread construction (*fadenconstruction*) of the lines of curvature on quadrics. For an intelligible reading of the paper, a previous paper of the author's, 'Ueber fadenstructionen des ellipsoides,' must be referred to. — (*Math. ann.*, xxi. 1883.) T. C. [639

Complexes of the second order. — M. Genty discusses Kummer's sixteen-nodal quartic by the methods of vector analysis. No new results or properties of this surface are given; but the paper is interesting as an application of this particular method. — (*Journ. de math.*, 1882.) T. C. [640

Hypergeometric series. — M. Mathieu studies the differential equation of the second order, satisfied by Gauss's function F $(\alpha, \beta, \gamma, \chi)$, and examines briefly the cases when the general solution of this equation can be expressed in a finite form, and obtains, in consequence, the cases when the function F $(\alpha, \beta, \gamma, \chi)$ can be expressed in finite form. He determines also the cases when the function F $(\alpha, \beta, \gamma, \sin^2\phi)$ is periodic with respect to ϕ, and has 2π for its period. — (*Journ. de math.*, 1882.) T. C. [641

Parallel surface to the ellipsoid. — Dr. Craig discusses the general equation of this surface, and its principal sections. Certain of its singularities are enumerated, and formulae are given for the ratios of corresponding elements of area and length upon the parallel and primitive ellipsoid. A number of formulae are given, referring to the curvature of the surface. Elliptic co-ordinates are employed throughout the greater part of the paper. — (*Journ. für math.*, xciii.) T. C. [642

PHYSICS.

Heat.

Specific heat of water. — The results of experiments on the specific heat of water at different temperatures differ, not only quantitatively, but qualitatively. Rowland and Münchhausen, whose experiments are the most reliable on this subject, have shown that the specific heat of water decreases to about 30°, and thence increases. In order to test these results, Hr. F. Neesen has made some experiments upon this subject with Bunsen's ice-calorimeter. The calorimeter was constructed according to the plan of Schuller and Wartha, in order to avoid the errors caused by the impurities of the snow. Hr. Neesen points out that it is of importance not to begin the experiment until some indications of melting appear in the ice of the calorimeter. If this point is not observed, the change of volume will be too small. The thermometers used were two mercury thermometers, graduated respectively to 0.2° and 0.1°. The results obtained by Neesen are to be considered merely approximate, as sufficient determinations of the specific heat at each temperature were not made. The results, however, agree qualitatively, though not quantitatively, with those of Rowland. — (*Ann. phys. chem.*, xviii. 3.) C. B. P. [643

Electricity.

High-pressure electric accumulator. — Mr. Frederick J. Smith describes an arrangement for prolonging the life of a gas-battery. The tubes containing the electrode are inverted in a tank nearly filled with dilute sulphuric acid. The tank is closed airtight, and the gases, as they are evolved, generate a pressure, which, as shown by a manometer, amounts to several atmospheres by the time the tubes are filled. The amount of gas which can be thus collected in the tubes is, of course, much greater than that collected under ordinary conditions, and the life of the gas-battery correspondingly longer. When a Faure accumulator is treated in the same way, the electromotive force of the polarization is affeced, but to what extent is not yet definitely determined. — (*Phil. mag.*, March.) E. H. H. [644

Bifilar suspension and absolute measurement. — F. Kohlrausch gives a mathematical treatment of the bifilar suspension, obtaining, as the complete expression for the directive force,

$$D = \frac{g}{l}\left[m\frac{e_1 e_2}{4} + \frac{2\pi\rho^4 E}{5}\right],$$

where m is the mass of the suspended body increased by half the mass of the wires; e_1 and e_2, the distance apart of the upper and lower ends respectively; ρ the radius, and E the modulus of elasticity, of the suspending wires; g, the acceleration of gravity; and l, half the mean length of the wires, diminished by $\rho^2\sqrt{\frac{2\pi}{m}}E$. Hence he deduces two methods of measuring the horizontal intensity of terrestrial magnetism, which he calls the bifilar-galvanic and bifilar-magnetic respectively. The first method consists in observing the deflections α of a magnet, and ϕ of a circular coil suspended at a distance a from the magnet, when $H^2 = \frac{D\tan\alpha}{a^3\tan\phi}$, subject to certain corrections. The second method consists in observing the deflections α and ϕ of two magnets, one large in respect to the other, when $H^2 = \frac{D}{a^3(1+T)}\left(1 - \frac{3}{8}\frac{d^2}{a^2} + \frac{\lambda^2}{a^2} - 2\frac{K}{a^3}\right)\frac{\sin\alpha}{\tan\phi}(1 - 2\tan\alpha\tan\phi)$, where d is the distance between the poles of the larger magnet, $K = \frac{M}{H}$ for the smaller magnet, λ its length, and T its torsion-co-efficient. On the 21st of October, 1881, the first method gave .19407, and on the 16th of February, 1882, the second method gave .19389, $cm^{-\frac{1}{2}}g^{\frac{1}{2}}sec^{-1}$, at Würzburg. — (*Ann. phys. chem.*, Dec., 1882.) J. T. [645

ENGINEERING.

Boston water-works. — An elaborate description of the additional supply of water for the city of Boston from Sudbury River, compiled by Mr. A. Fteley, the resident-engineer upon the work during its construction, has just been issued by the city government in a large, finely printed, and copiously illustrated volume. The works for supplying Boston with water from Sudbury River consist of three storage-reservoirs in Framingham, and a conduit from that town to Chestnut-hill reservoir in Brookline. In 1881 Sudbury River furnished to Boston more than twice the quantity of water supplied from Lake Cochituate; and steps have already been taken to increase still further the storage-capacity of the system. The volume begins with a discussion of the sources of supply, the rainfall, and the storage-capacity of the reservoirs. Next follows a general description of the dams and reservoirs, and of the several sections of the work, in all its engineering features. The quality of the water, the gauging of the river, and a discussion of the capacity of the conduit, and the flow of water over weirs, conclude the body of the work. The appendix contains valuable tables on water-supply hydraulics, and a large amount of information for the practising engineer. The work is illustrated with 69 large plates, commencing with a map of the Sudbury River watershed, and giving very fully the construc-

tive details of the dams and conduits. To give the city 40,000,000 gallons of water daily, it is estimated that the storage-reservoirs on Sudbury River should have a capacity of 4,900,000,000 gallons. So far, three reservoirs only have been built; having a capacity, with that of Farm Pond, of 2,000,000,000 gallons, intended to give a supply of 20,000,000 gallons daily to the city. — G. L. V. [646

Anthracite coal-fields of Pennsylvania. — Mr. Charles A. Ashburner read a paper on a new method of estimating the contents of highly-plicated coal-beds, as applied to the anthracite fields of Pennsylvania. The questions of the future production and ultimate exhaustion of these fields are of the greatest importance. In 1860 the population of the United States was 31,443,321, and 8,513,123 tons of coal were produced; i.e., actually shipped to market. In 1870 the population had increased twenty-two per cent (38,558,371), and the production of anthracite was nearly doubled, being 16,182,191 tons. For the year 1880, with a population of over 50,000,000, the product was 23,437,242 + tons. In 1882 the actual production was over 30,000,000 tons. It has been variously estimated that the 470 square miles containing this coal in Pennsylvania will be entirely exhausted in from 140 to 204 years. While Mr. Ashburner does not estimate the ultimate exhaustion, he has devised a method for estimating the contents of these fields from data now being obtained by the careful and practical geological and mining examinations of the state survey. The exact position and detailed structural shape of the coal-beds are first mapped by fifty-feet contour-lines along the floor of the beds, giving, completely and satisfactorily, their geometrical construction and shape. These surfaces are then developed into planes by the development into straight lines of the line of the bed, as cut by paralleled section-planes 1,600 feet apart. This graphical method is attended with errors which are mathematically discussed, and which have been formulated by Mr. Arthur Winslow. This method does not give the true area of the surface of a sphere, cone, or triangular trough. In the case of a sphere, it gives $\frac{\pi}{4}$ of the true area; in a cone, the error increases directly as the secant of the angle which the pitch of the cone makes with its axis; and in a triangular trough, which more nearly represents the shape of the anthracite basins, the error is very much less. A practical test has been made of this method in the Panther Creek basin, between Mauch Chunk and Tamaqua; and the maximum possible error in estimating the surface-area of the coal-beds was found to be 905 of 1 per cent. After the areas are thus found, the contents are obtained by careful measurements made in the mines to ascertain the actual number of tons of coal which are contained in a unit (one acre) of bed-area. In this way it has been estimated that the above basin originally contained 1,032,000,000 ± tons; that the area under development originally contained 92,000,000 ± tons, out of which latter area 54,000,000 ± tons have been taken. — (*Eng. club Philad.; meeting* March 17.) [647

CHEMISTRY.

(*Analytical.*)

Determination of organic matter in potable water. — In an extended examination of the various methods in use for determining the purity of potable water, undertaken by Prof. J. W. Mallet for the National board of health, special attention was given to the 'combustion process' of Frankland and Armstrong, the 'albuminoid-ammonia' process of Wanklyn, Chapman, and Smith, and the 'permanganate' process suggested by Forchhammer. Prof. Mallet finds that it is unsafe to base conclusions on a single determination by the combustion process; and the evaporation should be conducted by means of steam, in such a manner as to preclude the possibility of absorption of ammonia from the atmosphere. It was also found advantageous to conduct the evaporation under diminished pressure at quite low temperatures. In the albuminoid-ammonia and permanganate processes the most desirable results were obtained by keeping the volume of liquid in the retort constant and the permanganate in excess. Prof. Mallet thinks that more importance should be attached to the quantity of nitrites and nitrates than is usually assigned to them; and he finds that they may readily be reduced by phosphorous or hypophosphorous acid. These methods are regarded by him as an insufficient basis on which to reach a decision as to the condition of a water; and they should be made of secondary importance to evidence of a general nature, such as the source and history of the water examined. A thorough biological examination of water polluted in various ways is recommended. — (*Amer. chem. journ.*, iv. 241, 334, 426.) C. F. M. [648

Composition of a spring-water from Salzbrunn. — In an analysis of a spring-water from Salzbrunn, in Silesia, T. Poleck obtained the subjoined results in 1,000 grms.

Sodium chloride	0.05899 grm.
" sulphate	0.18010 "
Potassium sulphate	0.04085 "
Sodium bicarbonate	0.87264 "
Lithium "	0.01140 "
Calcium "	0.71264 "
Magnesium "	0.40477 "
Strontium "	0.00280 "
Manganese "	0.00181 "
Aluminum phosphate	0.00036 "
Alumina	0.00047 "
Silicic acid	0.03460 "
Total	2.23057 grms.

Bromine, boracic acid, barium, and nickel were present in quantities too small to be determined quantitatively. The free carbonic acid in 1,000 grms. amounted to 849.4 cc., at 10.5°, and 740 mm. pressure. This water would be classified as *alkaline-saline*, and also as strong *sodium-lithium*. It contains only minute traces of organic matter. — (*Journ. prakt. chem.*, xxvii. 45.) C. F. M. [649

Origin of arsenic and of lithium in waters containing calcium sulphate. — In examining different natural waters for arsenic, from Martigny, Bachu, and other localities, M. Schlagdenhauffen finds it in quantities varying between 0.0050 grm. and 0.0500 grm. per litre. Since arsenic is found in different varieties of gypsum, the author concludes that it is in the form of calcium arseniate. Its origin may be traced to the marls, where it existed as sulphide. By the action of acid calcium carbonate, it was probably converted into the sulpho-arseniate, and finally into the arseniate. When certain marls are submitted to the action of hydrochloric acid, the solution evaporated, and the residue extracted with a mixture of alcohol and ether, lithium may readily be detected by the spectroscope. Five grms. of the earth contain sufficient lithium to give a distinct red band. — (*Journ. pharm. chim.*, l. 464.) C. F. M. [650

AGRICULTURE.

Symphytum asperrimum as fodder. — This plant is reported to yield a large quantity of palatable and nutritious green fodder, even on poor soil,

and, under very favorable circumstances, to give as many as six crops per year. Experiments by Weiske confirm the fact of a large yield, and show that it is also fully as digestible as good hay, and contains a large proportion of nitrogenous nutrients. It is not always eaten freely, especially in the form of hay, and appears to be best adapted for soiling, or for the preparation of ensilage. — (*Journ. landw.*, xxx. 381.) H. P. A. [651

Fattening different breeds of sheep. — It is a well-known fact, that, in different breeds of the same species, the same fodder may produce very different effects. All experiments hitherto, however, have failed to show any notable differences of digestive power in such cases; and it would thus appear that the observed differences are due to the varying energy with which the constituents of the body are oxidized. In an experiment with two mature sheep, a southdown and a merino, on identical rations, from which identical amounts of the several nutrients were digested, Weiske found that the apparent gain of 'flesh' (nitrogenous matters) was greatest in the merino sheep; but this difference was somewhat more than covered by the greater growth of wool. So far as this single experiment proves any thing, it shows that not only the digestive powers, but also the proteid metabolism, of different breeds of sheep, are essentially the same, and indicates that the differences in the ease of fattening are due to differences in the rapidity with which non-nitrogenous substances are oxidized in the body. — (*Journ. landw.*, xxx. 385.) H. P. A. [652

Valuation of fodders. — The commission appointed in Germany in 1878, to devise a uniform method for calculating the money-value of fodders from their chemical composition, held its fourth meeting at Eisenach, Sept. 17, 1882, a report of which is presented by Prof. J. König. An abstract was presented of papers published on the subject since the last meeting of the commission; and this was followed by a discussion of the results thus far attained. No final conclusions were arrived at; but it was recommended, that, in such computations, the same price be assumed for crude proteine and crude fat, and that the carbhydrates be estimated at one-fifth the price of proteine. It is expressly set forth that this is only a provisional decision, and further investigations and computations are called for. — (*Landw. jahrb.*, xi. 849.) H. P. A. [653

Testing milk. — Jörgensen proposes to use the index of refraction of milk, or of whey prepared from the milk, as a test of purity, and asserts that it shows comparatively small variations, while even a small addition of water is plainly indicated. Chludsinski considers it necessary to determine the specific gravity of the whole milk and of the skim-milk, and the percentage of cream, in order to judge of the purity of a sample, and describes an instrument for this purpose, the specific gravity being determined by weighing a measured quantity of the fluid. — (*Landw. jahrb.*, xi. 701, 835.) H. P. A. [654

GEOLOGY.

Meteorites.

The Bishopville meteorite. — Dr. M. E. Wadsworth stated that a microscopic examination showed that the Bishopville meteorite, which fell in March, 1843, was composed of enstatite, felspar, augite, olivine, pyrrhotite, and nickeliferous iron. The enstatite contained many glass inclusions of similar form to the enclosing mineral. Numerous glass inclusions were also seen in the felspar, and many in both minerals were bubble-bearing. Most of the felspar showed the twinning of plagioclase. Glass inclusions have always been regarded, when found in terrestrial rocks, as indicating igneous origin. The composition and structure of this crystalline stone is like that of the gabbro (norite) variety of basalt. While, according to common custom, the speaker might have proposed a new name for this, he preferred to call it a gabbro or basalt, in accordance with the principles announced in Science of March 9. Chladnite, he said, was not a pure enstatite, but a crystalline aggregate of enstatite, felspar, augite, and olivine. The well-marked glass inclusions and the structure of this stone had, according to the speaker, an important bearing upon the question of the origin of meteorites, and were in accord with his previously published views. — (*Bost. soc. nat. hist.; meeting* April 4.) [655

METEOROLOGY.

Aurora borealis. — Herr H. Hansen's observations of the November (1882) auroral displays in Trondhjem, Norway, show that each continued an extraordinary length of time, especially during the week Nov. 12–18. Every night of this week the heavens were illuminated with the auroral light, while it was seen from 8 P.M. on the 17th till 6 A.M. of 18th. The most striking display occurred on the 18th, at 4.30 A.M., when a brilliant corona appeared in the zenith, from which vivid streams of light stretched to the horizon; while luminous waves flowed uninterruptedly from the latter towards the corona, diffusing so strong a light as to enable one with ease to read moderately clear print. — (*Nature*, Feb. 8.) H. A. H. [656

Polar research. — The French magnetic and meteorologic expedition to Cape Horn has taken up quarters at Orange Bay, Terra del Fuego, east side, lat. 55° 31′ S. Observations began Sept. 26, 1882. The party found the climate mild, the temperature, up to the time of the report, ranging from freezing to 61°. — (*Nature*, Feb. 8.) H. A. H. [657

PHYSICAL GEOGRAPHY.

Granular structure of glaciers. — E. Hagenbach-Bischoff reviews the previous study of this question from Hugi to Klocke (*Neues jahrb. miner.*, 1881, i. 23) and Forel (*Arch. sc. phys. nat.*, 1882, vii. 329), and shows by optical and physical characters that each grain of a glacier is a single crystal of ice. The crystals stand with their axes in all positions, so that their contact surfaces form a very irregular network of polygonal planes. When the ice is broken at a temperature below its freezing-point, the subconchoidal fracture is independent of the crystals; but on melting, the crystals separate along their contact surfaces, as is shown by the planes of penetration of a colored liquid (soluble aniline blue is best). As has long been known, the grains are smallest in the *névé*, and largest at the end and bottom of the glacier, where one was found measuring 14, 12, and 9 cm. Forel has thought that this growth comes by the addition of infiltrating water, and that the motion of the glacier is thus aided; but this supposes that the ice is porous enough to allow water to enter, and requires a low internal temperature (for an annual increase of 0.043 cubic or 0.014 linear measure, the ice must average −7° C.). Hagenbach-Bischoff contends that certain crystals grow at the expense of their neighbors: as the expansion of a freezing ice-crystal is greater along one axis than another, it follows that pressure will lower the melting-point by the greatest amount when directed along the axis of greatest expansion; consequently those crystals whose

axes of least expansion are parallel to the direction of pressure will grow at the expense of the neighboring crystals, whose axes of greatest expansion are most nearly parallel to the pressure. Hence only certain crystals grow; the others decrease and disappear: as a result, all the former should have their axes parallel to one another, and to the average greatest pressure when they arrive at the lower end of the glacier. The author found thirteen out of fourteen samples taken from the grotto at the foot of the Rhone glacier to have their axes vertical; others have noticed the same predominance of vertical crystals at the lower end of the Grindelwald and the Aletsch glaciers. It is possible that both these modes of growth occur together. To determine this and other long-lasting mysteries of glacial phenomena, many more observations are needed on the internal temperature and constitution of glacial ice. — (*Verh. naturf. gesellsch. Basel*, 1882, vii. 192; *Arch. sc. phys. nat.*, 1882, viii. 343.) W. M. D. [658

GEOGRAPHY.

(*South America.*)

Eastern Patagonia. — The records have lately been found of an expedition into eastern Patagonia, between lats. 43° and 47°, made in 1877 by the late H. Durnford, an English ornithologist, who died in South America in 1878. Durnford was accompanied by Messrs. Griffiths and Jones from the Welsh colony near the mouth of the river Chupat (Chubut of Moreno), and made a distance of about three hundred miles to the south-west before turning back. Important observations were made on the position and size of several rivers — Sengel, Sengellen, and Chupat — and lakes, — Colguape (Coluhuape) and another equally large (later named Lake Musters by Moreno), — besides many smaller salt lagoons, all shallow, and apparently much decreased from their former extent. The country was very monotonous, showing nearly everywhere the same barren sterility, occasionally relieved by a lagoon or gully containing water. Bare hills and slopes of sandy marl, and volcanic rocks of varied shape and color, from pale brick-red to black, formed the general surface. Sometimes the traveller's way led across deposits of soft, yielding dust, and again over hard, unbroken rock. The animal and plant life, wherever found, was stunted and dwarfed. Evidence of former marine submergence was found on the table-land in well-rounded pebbles, gigantic oyster-shells, and numerous fragments of smaller shells. The rivers are now sunk in many places several hundred feet below the plain, and flow between steep banks. Numerous cairns containing Indian skeletons were found on hilltops. They are carefully built of stone, the blocks often being of a considerable size. The route followed by Durnford's party was like that taken by Moyano in 1880. — (*Proc. roy. geogr. soc.*, 1883, 84.) W. M. D. [659

Rio Pilcomayo. — A brief note furnished by Marguin, a member of Fontana's expedition in search of Crevaux, shows the Pilcomayo to be one of those newly established rivers on a very flat surface, with but little descent to its base-level of drainage. The exploration reached lat. 24° 40′ about one hundred miles from Asuncion, on the Paraguay; and, especially in the upper half of this distance, the river meandered very irregularly through a low forest-covered country, often interrupted by lagoons. Its banks were naturally raised about twelve feet by deposits of sand in five-inch strata, separated by thin layers of vegetable origin; and at time of flood the waters were thus divided into three parallel courses. As the water of the main channel subsided, the overflow drained back through breaches in the banks, having temporarily the appearance of affluents. The channel was often interrupted with snags, and bore signs of frequently changing its position to avoid the bars formed about them. The several neighboring streams (Rio del Fuego, Aguaray-Guazu, mboicae, Confuso del Sur), by which part of the Pilcomayo may have once been discharged into the Paraguay, are regarded as its former channels abandoned by these changes. Marguin recalls Padre Patiño, who attempted to ascend the river in 1721, but was forced back by the Indians on approaching lat. 23°; Van Nivel and Acha's attempt from Bolivia in 1844, which failed to pass a great lagoon at some point farther up stream than Patiño's goal; and, finally, Crevaux' party, which more nearly attained success than any of the others. — (*Comptes rendus soc. géogr. Paris*, 1883, 60.) W. M. D. [660

Antioquia. — The narrative of a journey through this north-western province of Colombia, by Fr. v. Schenck, gives an entertaining account of its inhabitants and their condition. On the way inland from the northern seacoast, Schenck found the navigation of the Magdalena a difficult undertaking, from its numerous sandbars, and shifting, entangled channels. Below Magangué its valley is fairly cultivated; but farther up stream the forest wilderness is hardly broken for a long distance, and the towns named on the maps are represented by a few huts occupied by negroes and chinos, who supply the river-steamers with wood. This region is very warm and unhealthy. The ruins of a few chapels remain from the early times of Spanish occupation, but they have been long abandoned by the priests. Farther south, where the river forms the eastern boundary of Antioquia, which Schenck regards as the best province of the country, there is more clearing; the people are industrious, and of a much better morality than those of Spanish descent generally are, so that the traveller calls them Puritans. The road from Nare (about 150 met. elev.), on the Magdalena, westward to Medellin (1,480 met.), crosses two ranges that rise to 2,220 and 2,530 metres. An interesting description is given of Medellin, where the author found a curious mixture of civilized comforts with the makeshifts of an isolated region. An excursion was made northward, over a plateau, to the gold district of Santa Rosa de Oros, and beyond to the falls of the Guadalupe (lat. 6° 46′ N.), — the highest (250 met.) in Colombia, surpassing those of Tequendama (139 met.), near Bogotá, in the surrounding scenery as well as in height. The falls of the Guadalupe have also the advantage of being well seen from a neighboring point of view, where the stream is in sight from its upper placid flow, past the rapids to the cataract, which glides over a sloping, rocky surface to the gorge below. The climate of Antioquia is considered healthy, except in the low, warm valleys. In January and February the air is cool, and the sky clear. There are two rainy seasons, — in the north, from March to June, and from August to November; and in the south, from March to May, and from September to November. The rainfall thus seems to depend on the solar culmination; and the dry season, on the occupation of the country by the trade-winds. — (*Peterm. mitth.*, 1883.) W. M. D. [661

BOTANY.

Cryptogams.

The rot in European grape-vines. — Professor Millardet of Bordeaux, in a paper entitled 'Pourridié et Phylloxera,' explains how the attacks of the well-known Phylloxera destroy the grape-vines in France.

The insect produces larger swellings in the roots, which Millardet calls nodosities, and smaller swellings, which he calls tuberosities. The nodosities appear at any time from April to September, whilst the tuberosities are not found before August. The rotting of the roots is caused by the invasion of a fungus which enters through the cracks in the nodosities and tuberosities. According to Millardet, the fungus is what is known as Rhizomorpha subterranea when it occurs in the ground, and R. subcorticalis when it grows in the roots and stems. Hartig and others consider the fully developed form of the Rhizomorpha to be the toadstool (Agaricus melleus), which is common near Bordeaux, especially on oaks. The mycelium of this fungus makes its way into the soil of the vineyards from neighboring groves, and enters the roots of the vines which have been attacked by the Phylloxera, and produces a white rot, commonly known as pourridié. The writer concludes as follows: "It is beyond doubt, that the disease caused by Phylloxera predisposes to that of the rot. Should one say in these cases that the vine succumbs to the rot and not to the Phylloxera? Evidently not; since, without the Phylloxera, the rot would not have made its appearance." — W. G. F. [662

Two curious fungi of the United States. — The two genera Testicularia and Cycloderma were described by Klotzsch in 1832; but since that date botanists have been unable to recognize the two genera with certainty. Cooke now describes a new Cycloderma Ohiensis, and shows that the Milleria herbatica of Peck is the long-lost Testicularia cyperi of Klotzsch. — (*Grevillea*, March, 1883.) W. G. F. [663

Bangiaceae of Naples. — The eighth monograph of the fauna and flora of the Bay of Naples comprises the Bangiaceae, by Dr. G. Berthold, and is of interest, since he now gives the details of the formation of the spores; these are formed by the action of antherozoids on the cells of the thallus, which can hardly be said to produce trichogynes, as is the case in all other Florideae, to which, however, the Bangiaceae apparently belong. — W. G. F. [664

Bacteria in fishes. — Olivier and Richet have examined 150 fishes of different genera and species, and find, in all cases, that there are microbes in the blood and lymph. They conclude, that, contrary to what is believed to be the case in other vertebrates, microbes occur normally in the fluids of fishes. — (*Comptes rendus*, 1883.) W. G. F. [665

Phenogams.

Functional differentiation in stamens. — Fritz Müller adds Mollia, Sagerstroemia, and Heteranthera to the list of plants having two sets of stamens in each flower, one of which attracts insects, and supplies them with food, while the other serves for pollination by their aid. Experiments show that the crape-myrtle (Sagerstroemia), though self-sterile, is readily fertilized by pollen from either set of stamens of another variety grown in other gardens. The dull color of the longer stamens in the cases mentioned, and of the long stamens in short and mid-styled flowers of the trimorphic Lythrum, is explained as beneficial, as their lack of conspicuousness renders these unprotected stamens less liable to the depredations of pollen-eating insects than would otherwise be the case. As examples of plants whose stamens are differentiated into sets having different forms and offices, but without the color-contrasts found in most instances, a species of Cassia and Solanum rostratum are mentioned. — (*Nature*, Feb. 15.) W. T. [666

Capture of prey in Sarracenia. — In a compilation on pitcher-plants, Mr. James makes the curious suggestion that the insects which are found so abundantly in the pitchers of Sarracenia purpurea are first intoxicated by feeding on the pollen or nectar in its flowers, whence they fall into the leaves. — (*Amer. nat.*, March.) W. T. [667

Bee-flowers. — In his 'signs and seasons,' John Burroughs states that hepaticas are sometimes fragrant, sometimes scentless, the same being true of the arrow-leaved violet. Humblebees perforate flowers of the locust for their nectar, and hive-bees afterward make use of the openings. Rarely the honey-bee works upon the blossoms of trailing arbutus. In midsummer it reaps a harvest from the smooth sumach. It has also been observed on the white oak and skunk cabbage. — (*Century mag.*, March.) W. T. [668

Origin of anemophilous flowers. — Adaptation to fertilization in the wind-swept, treeless areas over which they prevail, is believed by Grant Allen to be the reason for the inconspicuous wind-fertilized flowers of grasses, which are considered degenerate descendants of conspicuous-flowered plants related to the Liliaceae. Passing notice is given to the pollination of rushes, sedges, and related plants. — (*Macmillan's mag.; Pop. sc. monthly*, March.) W. T. [669

New Passifloreae. — The collection of Passifloreae made by M. André in Ecuador and New Granada in 1875 and 1876 has been worked up by Dr. Masters. It comprised nine species of Tacsonia and over thirty of Passiflora, half of which are new. The list is accompanied with numerous critical notes and with revised synonymy, as supplementary to Masters's monograph of the order in the 'Flora Brasiliensis,' and to Triana and Planchon's of the New Granada species, — all the more valuable for the unusual excellence of André's specimens, and his descriptive notes and careful analytical drawings from the living plants. — (*Journ. Linn. soc. Lond.*, Feb., 1883.) S. W. [670

ZOÖLOGY.

Mollusks.

Disease in oysters. — A new disease has recently appeared in the Rappahannock oysters, called, locally, 'the black spot.' A small black spot, imperceptible to a careless observer, appears upon the oyster, and shortly afterward death ensues. All around the spot the meat is good; but this, when bitten into, proves bitter and nauseous. It is considered the most serious of the afflictions to which the mollusk is subject. — (*Hopson's Sea world*, March 15.) W. H. D. [671

Venus mercenaria in Britain. — It appears from a note by Mr. F. P. Marrat, that Venus mercenaria L., our round clam or quahaug, has become naturalized in British waters. In 1869, Capt. I. H. Mortimer introduced this shell-fish into England, where specimens were put into the sea at Southport, at the mouth of the Mersey, and at Crosby, on the Lancashire coast. It is believed that an American, Mr. H. D. Brandeth, doing business at Liverpool, and residing at Hilbre Island, near the mouth of the Dee, deposited both this species and the American oyster in the waters adjacent to the island, four or five years ago. At all events, large numbers of the shells of the Venus have recently been found by collectors, cast up on the shores near Hilbre Island in such a manner as to indicate that this species has become fully acclimatized there. — W. H. D. [672

Insects.

Innervation of the respiratory mechanism in insects. — Dr. O. Langendorff denies Dönhoff's state-

ment that respiratory movements in insects cease after decapitation. Experiments on humble-bees, wasps, cock-chafers, and dragon-flies, show that these movements continue in the abdomen after removal of the head, and even of the thorax. Indeed, in some cases, sections of the abdomen of a dragon-fly, as small as one ring and a half, continued the rhythmical respiration. It is therefore evident that the nerve-centre for respiration is not in the head. A decapitated cock-chafer breathed for an hour. Heat was found to increase the activity of respiration in mutilated, as in healthy individuals. Graphic illustrations are given of normal respiration, and compared with those obtained from decapitated specimens. — (*Archiv anat. phys.*, 1883, 80.) E. B. [673

(*Economic entomology.*)

Food of Carabidae and Coccinellidae. — The view of the habits of the two principal predaceous families of Coleoptera, which is common among entomologists, is largely due to hasty generalization, based upon insufficient data. Observations of the food of these beetles have hitherto been left almost wholly to chance. Two years ago Prof. S. A. Forbes and Mr. F. M. Webster published the results of a series of careful investigations of this subject. This work has been continued by Prof. Forbes, who now gives the result of an examination of the contents of the stomachs of 175 specimens (representing 38 species and 28 genera) of Carabidae, and 38 specimens (7 species and 4 genera) of Coccinellidae. A great diversity of habits of the different genera appears. Thus no trace of vegetable food was found in Calosoma; in Galerita, from 6% to 12% of the food was vegetable; in Pterostichus, 20% to 25%; and in Harpalus, 87%. In the Carabidae as a whole, 57% of the food was vegetable, and 36% insects. In the Coccinellidae, 45% was spores of fungi, 14% pollen of grasses and Compositae, and 35% insects. — (*Bull. Ill. state lab. nat. hist.*, No. 6, Jan., 1883.) J. H. C. [674

Food of Wisconsin birds. — Under the title 'Economic relations of Wisconsin birds,' Prof. F. H. King publishes notes on nearly three hundred species which occur in that state. This work is of especial interest to economic entomologists, as it contains the results of an examination, by a very careful worker, of the contents of the stomachs of over eighteen hundred birds. To the original observations are added notes from the publications of various ornithologists; so that a fairly complete *résumé* of what is known respecting the food of each of the species is given. — (*Wisc. geol. surv.*, i.) J. H. C. [675

VERTEBRATES.

Motor-nerve endings. — W. Kühne has published two articles on this subject, having extended his observations to a considerable number of vertebrates. He gives descriptions of the manifold forms of the terminal ramifications of the axis-cylinder in various species. As the best method of bringing this *axial-baum* into a visible state while preserving its natural form, he recommends giving a minimum dose of curare, and then sending tetanic electric irritation through the nerve. After this treatment, the motor-plates can be seen with surprising ease and distinctness. Particularly important is his new method of isolating the end-plates. Gold preparations are softened in slightly acidified glycerine until the muscular fibres can be pressed apart, which, being done, isolated terminal plates are found, showing the real arborization, which is quite different from the apparent arborization before isolation. The ramifications are composed of the axis-cylinder, and a sheath of substance to which Kühne gives the not very suitable name of stroma, and which separates the axis-cylinder from the fundamental substance of the motor-plate. A fuller notice will be given upon the appearance of the definite memoir, with the promised illustrations. — (*Verh. naturh.-med. ver. Heidelb.*, iii. 97, 212.) C. S. M. [676

Nerve-endings in muscles. — The terminal ramifications in Rana are formed, according to Trinchese, of little disks, placed at more or less regular distances from one another, being separated by a homogeneous intermediate substance. From these (Kühne's) ramifications, on the side towards the muscles, run out numerous very fine filaments. The 'longitudinal striae' (fibrillae?) of the muscle have a similar structure to that of the axis-cylinder, being formed of disks united by clear intermediate substance; and the disks are united by lateral filaments with one another. In the intercostal muscles of the boaconstrictor the motor-plates are often subdivided into five or six parts, lying asunder, though connected by filaments. — (*Att. accad. lincei*, 1882, 83.) C. S. M. [677

Motor-centres in the cerebral cortex. — As an appendix to an article on the irritability of the spinal cord, Schiff enters into a long discussion on the nature of the so-called 'motor centres' in the gray matter of certain convolutions of the cerebral hemispheres. The article is too long and too polemical to be briefly abstracted, but is well worth reading. Schiff points out, that, with the exception of Ferrier, all experimenters (even including Fritsch and Hitzig) have given up the belief that the irritable areas are the motor centres for voluntary movements, and account for the phenomena following stimulation in other ways. Schiff's own belief is, that the so-called motor areas are but reflex centres, in which, during the normal functioning of the body, tactile nervous impulses are reflected to the true and deeper-lying motor centres. — (*Pflüg. archiv*, xxx. 212.) H. N. M. [678

Mammals.

The domestic animals of Camargue. — Col. Basserie gives some interesting facts regarding the domestic animals of this large, low-lying, and marshy island, which is situated at the mouth of the Rhone. The sheep, of the Rambouillet breed, are small and rough, but of peaceful disposition, and very vigorous. They furnish good meat and wool, which has long been esteemed in France for its length and fineness. The cattle are black, small, nervous, and very energetic. They live in the wild state in the great marshes of the island, and are absolutely of no value to the husbandmen; nor do they furnish a means of entertainment, as they did in the days when bull-fights were not prohibited. The horses, which, like the cattle, receive almost no care, and are constrained to feed upon the coarse vegetation of the marshes, and to endure great and sudden changes of temperature and thirst, are small and ill-appearing, having massive jaws, and large and prominent joints and ligaments. They are, nevetherless, hardy, energetic, and subject to few diseases. In color they are light gray. — (*Bull. soc. agric., etc., de la Sarthe*, xxviii. 521.) F. W. T. [679

The nature of elephant's milk. — "According to the *Moniteur scientifique*, the milk of the elephant has a composition very closely allied to that of cow's milk. The globules of butter are large, transparent, and have sharply defined contours. The fatty matter has a clear yellow color. It is liquid at ordinary temperature, and solidifies at 18° C. below zero." — (*Revue scient.*, Jan. 13.) F. W. T. [680

ANTHROPOLOGY.

American archeology in Europe. — Dr. Daniel G. Brinton called the attention of the Numismatic and antiquarian society of Philadelphia, on March 1, to the following facts, with reference to the studies of American prehistoric antiquity. The stone sculptures, first discovered by Dr. Habel and described in the Smithsonian contributions to knowledge, have been removed from Santa Lucia Cozumelhualpa, near Guatemala, to the Royal museum of Berlin. Prof. Adolph Bastian, director of the museum, has published a description of them in a quarto of thirty pages, with three full-page lithographic plates. Within the last year or two, Prof. Leon de Rosny has visited Madrid, Dresden, Basle, and other cities, to study the relics of American civilization. In Madrid he identified the continuation of the 'Manuscript Troano,' which he is now preparing for the press. Count Hyacinthe de Charencey has collected into an octavo volume of a hundred and ninety-five pages his essays on American philology and paleography. Dr. Hamy discusses the cross of Teotihuacau. The Marquis of Nadaillac has brought out a volume on prehistoric America; and Dr. Max Steffen gives us a monograph on the agriculture of the ancient American civilized peoples, — the Aztecs, Mayas, Chibchas, and the Quichuas. The full titles of these works are given in the paper cited. — J. W. P. [681

The Mexican national museum. — It may not be known to all the readers of SCIENCE that the land of the Aztecs is no longer open to the indiscriminate plunder of relic-hunters. There is at the national capital a museum, rich especially in relics of ancient Mexican history. A quarterly report is issued, called *Anales del museo nacional de Mexico*, now in its third year, which is liberally circulated to libraries throughout the United States. Much of the space in this publication is devoted to archeology and decipherment of ancient inscriptions. The principal contributors are J. Sanchez, Gumesindo Mendoza, Orozco y Berra, and Sr. d. Jcazbalceta and Alfredo Chavero. Señor Chavero has for a long time been prosecuting his studies upon the ancient Mexican calendar; and Señor Mendoza has collected a large number of Nahua myths, which he is giving to the world. The anales is printed by Ignacio Escalante, No. 1, Bajos de San Agustin, Mexico. — J. W. P. [682

Anthropology of France. — The study of the natural history of man is very similar to the science of geology. It is possible to select a certain epoch, — say, the glacial, — and trace over all the earth the evidences of its extent. We may seek to comprehend the succession of all the epochs throughout our planet; or, selecting a particular locality, the specialist may study minutely the exact order in which the various strata have manifested themselves there. The anthropologist now traces up the wanderings of the Celtic stock, now seeks to unravel the mystery of races, and finally, circumscribing his search to his own land, inquires how various stocks of men have succeeded one another in its borders. Such a work has M. Gustave Lagneau done for France. Various tentative efforts were made, and their results published in current French scientific journals. Finally his perfected labors found permanent utterance in the *Dictionnaire encyclopédique des sciences médicales*, under the title *Anthropologie de la France;* and this has been separately printed by G. Masson, Paris. The subject is treated under two forms: 1. Ethnologie analytique, ou Étude spéciale de chacune des races ayant concouru à la formation de la population de la France; 2. Ethnologie synthétique, ou Étude générale de l'ensemble de la population de la France considérée dans sa complexité ethnique. — J. W. P. [683

The Indian-office report. — In addition to the mere detail of annuities and reservations, the report of the commissioner of Indian affairs is becoming more and more useful to the anthropologist. The volume for 1882 is, in this respect, the most valuable that has appeared. The report proper, filling eighty-two pages, covers the whole ground of administration, draws attention to abuses, and suggests important reforms. This is followed by a hundred and ninety pages of finely printed digests of correspondence with agents. By carefully running over these letters, one gets here and there some precious bits of information gathered by witnesses on the spot. Indian legislation, government liabilities, directory of agencies, the disbursement of funds, executive orders, catalogues of tribes and reservations, — are all minutely and intelligibly set forth. The report on education includes school population, number and accommodations of boarding and day schools, attendance, cost, native and white teachers, results in the number who can read, and in the acres ploughed, produce raised, and stock owned. The industries taught in each boarding-school are given in each case.

Whole number of Indians	259,632
School population of uncivilized	34,662
Boarding-schools for uncivilized	73
Day-schools " "	105
Boarding-school accommodations of uncivilized	4,903
Day-school " " "	5,299
Average attendance	5,569
Cost to government and religious societies	$355,102
Cost of Carlisle, Hampton, and Forest Grove	$141,276
Number who can read	14,532
Bushels of corn raised	12,713
" " vegetables raised	17,200
School population of five civilized tribes	9,315
Boarding-schools	14
Day-schools	199
Boarding- and day-school accommodations	8,528
Pupils in boarding-schools	1,043
" " day-schools	4,596
Cost to the five nations	$151,950
" " religious societies	$8,089
Number who can read	29,600

A great variety of information respecting population, industries, subsistence, vital and criminal statistics, completes the volume. — J. W. P. [684

Krao, the human nondescript at the Westminster aquarium. — Her appearance and mental condition, and that of her father, are described by A. E. Keane, who holds, that, should the statement in regard to the latter prove true, it would appear that a hairy and straight-eyed race, kindred to the Ainos of Japan, exists in Farther India. — (*Nature*, xxvii. 246.) F. W. T. [685

The Wyoming historical society. — Publication No. 4, of the Wyoming historical and geological society, contains an illustrated description of the finer specimens of Indian earthenware pots in the society's collection. The vessels are of the wide-mouthed variety, like the old dinner-pots, and are equal to any of the same class found in the West. — J. W. P. [686

EGYPTOLOGY.

Pithom-Succoth. — The explorations at Tell-el-Maschuta, carried on under the direction of the eminent Egyptologist, Naville, are yielding further fruit. A statuette of red granite, 65 cm. in height, with inscriptions, contains "the name Pithom (Pa-tum) three times in a form varied from that first found; the name of the god Tum, in Pa-tum, being written ideographically." — "The back bears a laudatory inscription, saying how well this functionary

discharged his duties, and served his king Osorkon II., of the twenty-second dynasty, whose monuments are very rare." — "Several fragments, with portions of the cartouche of Osorkon II." were also found, and "a hawk in red granite more than a metre high, bearing between his claws one of the cartouches of Ramses II., the presumed builder of Pithom." — (*Academy*, March 10.)

One ruin in Egypt has been fully explored. M. Naville, with sufficient funds at hand, has, in less than two months, 'completed the examination of Pithom.' The result has been the identification of the site, and the determination of some geographical and historical problems. Inscriptions in Greek and Latin prove Pithom to have been Hero, 'the storehouse,' and Heroöpolis, 'the store-city.' M. Naville says, "It was Ramses II. who was the founder of the city. He built the storehouse and the temple, but did not finish what he had begun. In the line of the Dromos we find great blocks of granite and of a hard calcareous stone, which had evidently been brought there to make some large tablets or statues, which have been left with marks of the sculptor only. The temple was small, and (the city being chiefly a storehouse and a fortress) had no reason to have many works of art." The Egyptian exploration fund, through the liberality of Sir Erasmus Wilson, has reaped the reward of employing a cool-headed Egyptologist of the first rank, and placing sufficient funds at his command to do his work quickly and thoroughly. — (*Academy*, March 17.)

H. O. [687

INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

PUBLIC AND PRIVATE INSTITUTIONS.

Harvard university, Cambridge, Mass.

The chemical laboratory. — During his journey in Europe last year, the director added very materially to the means both of instruction and of research at the laboratory. A dynamo-electrical machine, with an adequate motor, has been placed in the basement of the building. The apparatus required for investigations in the new branch of the science, called thermo-chemistry, has been procured. Several hundred valuable specimens have been added to the mineral cabinet, and placed on exhibition in the cases; and a favorable opportunity enabled the director to procure, at small cost, several thousand characteristic mineral specimens for the use of students. It has been very difficult, hitherto, to procure suitable specimens in sufficient number and variety for the large class in mineralogy; and this want having been thus supplied, the laboratory teaching in this subject will be made more effective.

Museum of comparative zoölogy, Cambridge, Mass.

The Schary collection of fossils. — The most valuable accession received during the past year is the collection of Silurian fossils of Bohemia, brought together by the late J. M. von Schary, which has been purchased from his heirs. This collection is of the greatest value to American paleontologists, as it will give them the means of comparing the types of the great collections which have formed the basis of the works of Barrande and of Hall. Some idea of the magnitude of this collection may be formed from the fact that it contains over a hundred thousand specimens. Of these, probably two-thirds of the collection — no less than 1,231 species, representing 157 genera — are identified.

The Schary collection, taken in connection with those brought together from American localities, now makes the museum collection of paleozoic fossil invertebrates one of the finest in existence.

Peabody museum of American archeology, Cambridge, Mass.

Shellheaps on the coast of Maine. — The material obtained during last summer's explorations of shellheaps on the Damariscotta River and Muscongus Sound, is of special interest. At the heap on Keene's Point, considerable pottery was found, and an unusual number of stone implements. In addition to the ordinary implements made of bone, a harpoon-point was obtained, having two barbs and a perforation, showing that it was attached to a shaft by a string. In another heap, on Hodgdon's Island, Mr. Gamage found a similar perforated point with a single barb. These are believed to be the first specimens of this character from the Atlantic shellheaps; and they are of special interest, from their close resemblance to points from the North-western Coast. Most of the stone implements were rudely chipped forms; but one polished stone celt was found at some depth in the heap at Keene's Point. This deposit consists principally of clam-shells; although the valves of oysters, quahaugs, and scallops, were found, as well as the shells of Buccinum and Natica. Many broken bones of animals were abundant. The most common were those of the deer, moose, and bear; but those of the fox, otter, skunk, beaver, seal, and several other species of mammals, are noted; also the bones of several species of large birds, those of a turtle, and several species of fishes, as the codfish, flounder, devil-fish, and sturgeon. Human bones were obtained from a shellheap on Fort Island; and portions of a human skeleton dug out of the great oyster-heap at Newcastle were secured. A spear-point of bone was found by Mr. Phelps, about one foot below the surface, in the Keene's Point heap; and above it, just under the sod, he found an iron point of nearly the same size and shape, which was probably made out of a piece of hoop iron in imitation of the earlier bone implements. An iron spear and an iron axe of very old form were also found in the shells near the surface of the deposit, which, with a small clay pipe of a kind made in England about the middle of the seventeenth century, found also by Mr. Phelps ten inches deep in the shells, show that this particular deposit was added to by the Indians after contact with the whites, though there can be no doubt that it was commenced long before that time.

State university of Kansas, Lawrence.

Weather report for March. — The temperature, rainfall, cloudiness, and wind-velocity were below the March averages. An occurrence unprecedented in Kansas was the continuous cloudiness of the last eight days of the month, during seven of which the wind did not change from a north-east direction.

Mean temperature, 40.90°, which is 0.90° below the average March temperature of the fifteen preceding years. The highest temperature was 69°, on the 17th and 22d; the lowest was 16°, on the 19th; monthly range, 53°: mean temperature at 7 A.M., 34.84°; at

2 P.M., 48.64°; at 9 P.M., 40.08°. The mercury fell below the freezing-point on thirteen days.

The first blossoms of the white maple (Acer dasycarpum) were observed on the 1st; of the white elm (Ulmus Americanus), on the 8th; and of the dog-tooth violet (Erythronium albidum), on the 23d; these dates being considerably later than usual.

Rainfall, including melted snow, 1.28 inches, which is 0.96 inch below the March average. Rain or snow, or both, fell on eight days, on one of which the amount was too small for measurement. The snow was at no time more than sufficient to whiten the ground. There was one thunder-shower. The entire rainfall for the three months of 1883 now completed has been 4.32 inches, which is 0.39 inch below the average for the same period in the past fifteen years.

Mean cloudiness, 48.92 % of the sky, the month being 0.96 % clearer than usual. Number of clear days (less than one-third cloudy), 13; entirely clear, 4; half-clear (from one to two thirds cloudy), 8; cloudy (more than two-thirds), 10; entirely cloudy, 8: mean cloudiness at 7 A.M., 49.03 %; at 2 P.M., 50.64 %; at 9 P.M., 47.09 %.

Wind: N.E., 30 times; N.W., 24 times: S.W., 23 times; S.E., 7 times; N., 4 times; W., 3 times; E., once; S., once. The entire distance travelled by the wind was 12,080 miles, which is 2,728 below the March average. This gives a mean daily velocity of 389.68 miles, and a mean hourly velocity of 16.24 miles. The highest velocity was 50 miles an hour, on the 18th.

Mean height of barometer, 29.164 inches; at 7 A.M., 29.181 inches; at 2 P.M., 29.147 inches; at 9 P.M., 29.164 inches; maximum, 29.774 inches, on the 3d; minimum, 28.630 inches, on the 18th; range, 1.144 inches.

Relative humidity: mean for month, 65.6; at 7 A.M., 75.4; at 2 P.M., 49.4; at 9 P.M., 72.0; greatest, 100, on the 24th; least, 21, on the 17th. There was no fog.

NOTES AND NEWS.

— It will be remembered that the great comet of 1882 was first noticed by railroad employees in the Argentine Republic, and that Dr. Gould's attention was called to it as seen Sept. 6. On Sept. 7 it was seen at the Cape of Good Hope and in Australia; and on the 11th, Cruls saw it at Rio, and cabled its discovery. Finally, A. A. Common of London announced its discovery in England on Sept. 17.

By the courtesy of Prof. E. C. Pickering of Harvard college observatory, we are allowed to publish the following translation of a letter from the director of the observatory at Chapultepec to the secretary of state and interior of Mexico, which shows that the comet was seen in Mexico on Sept. 14.

I have the honor to communicate to you, that this day, between five and six in the morning, there has been observed at this observatory, by Felipe Valle, a comet which was seen yesterday by Francisco Toro, an employé of the central meteorological station.

The data which Sr. Valle has been able to collect are the following: the approximate position of the comet was 10h. 30s. right ascension, and 1° 15′ declination south, placing it, consequently, in the constellation Sextaus Uraniae, a little below and about half way between α Hydrae and α Leonis (Regulus), with which stars it forms a nearly right-angled triangle. Its nucleus appears as a star of the second magnitude, having a strong resemblance to Mars, both on account of its red color and its brilliancy. The nucleus is separated entirely from the coma, both this and the tail having a transparent yellow color. The tail is 5° to 6° in length. The breadth of the coma is about 1′ 3″, and, of the nucleus, about 40″. The tail has sharply defined edges, and is straight at its origin, but appears to bend further on, with the convex side towards the zenith. The comet appears on the horizon at 5h. 12m., and can be seen by the naked eye up to 5h. 40m.; that is, eight minutes before sunrise; but with the telescope of our altazimuth instrument, using a magnifying power of thirty-nine diameters, it can be seen even fifteen minutes after the sun is up.

I shall give you information in regard to our future observations.

Chapultepec, Sept. 14, 1882.

— The Philosophical society of Washington, at its meeting March 24, listened to an account, by Prof. J. R. Eastman, of the methods and success of the Florida expedition for observation of the transit of Venus, and to an historical and critical review, by Professor Cleveland Abbe, of methods of determining the temperature of the air. A communication from Professor Charles E. Munroe described a method of ascertaining the specific gravity of solids by means of the hydrometer.

— A mathematical section of the Philosophical society of Washington has been formed. At the meeting held March 29, Professor Asaph Hall was elected chairman for the year 1883, and Mr. Henry Farquhar secretary. Mr. Alex. S. Christie read a paper on 'A quasi general differentiation,' which was discussed by Messrs. C. H. Kummell and E. B. Elliott.

— Mr. Albert E. Menke has been elected to the professorship of agriculture and agricultural chemistry in the Kentucky state college.

— The Ohio weather bureau has decided on a set of signals which will be displayed on the sides of the baggage-cars of moving trains. A red sun will indicate higher temperature; star, stationary; and moon, lower. A blue sun, general rain or snow; star, local rain or snow; and moon, clear or fair weather. These signals will be placed, one above the other, on a white ground, and will be as large as the space will allow. It is believed that they can be distinguished at a considerable distance.

— The Boston society of natural history has just issued a list of its officers and members, — the first that has been printed for fifteen years. It shows that its resident membership has fallen in that period from 492 to 422. Women have been admitted to membership, and a new class added of associate members, through which all must pass on their way to corporate membership. In the same way its list of honorary members has fallen from 31 to 20, and of its corresponding members from 228 to 109. The latter lists have clearly been strengthened by the decrease.

— A treatise on projections by Dr. Thomas Craig has been published by the U. S. coast and geodetic survey in a quarto volume of 247 pages.

— Circulars have been issued by the German-Austrian alpine union, calling for contributions in aid of the sufferers from the floods in Tyrol and Carinthia last year. In answer to the first, nearly 40,000 florins were received. Details of the damage caused by the floods are reported by the several sections of the society.

— The highest meteorological observatory in the British Empire has just been organized on the government cinchona plantations in Jamaica. The mean annual rainfall at this particular spot and elevation (4,900 feet) is given as 136 inches, and the mean annual temperature as 60° F. The record of observations will be published in the *Jamaica gazette*.

— Buffalo supports a second scientific society in the Naturalist's field-club, the first (double) number of whose Bulletin is recently issued. Six numbers a year are promised; and if this youthful company of fifty persons, half of either sex, succeeds in filling them with as good material in local natural history as is furnished here, we would wish them all success.

— J. Thomson arrived at Zanzibar Jan. 29, and hopes to complete his preparations for a two-years' trip inland by March 2. He found difficulty in securing porters, as Fischer had taken the best men; but he secured Manya Sera, who had charge of Stanley's party.

— M. Thouar, a French explorer, reports his arrival at Medellin (Antioquia, Colombia) in December last. He goes to Bogota and Quito, and, after a short rest in these cities, will follow the Andes along to Chuquizaca (Sucre), at the head of the Pilcomayo.

— Dillon, French consul at Tientsin, undertook a journey into Mantchuria last January.

— The first two miles of railroad on the upper Senegal, constructed by the French, were opened Dec. 19, 1882, the natives running and shouting after the train as long as they could follow it. Col. Berguis-Desbordes has gone on to Bamaku, on the Niger, where he arrived Feb. 1. On Jan. 16, he burned Daba, whose chief offered the only resistance he met on the way.

— A new Italian expedition, under Bianchi, will go into the interior of Abyssinia with presents to the king, in hopes of obtaining the papers and collections left there by the deceased traveller, Antinori. An attempt will also be made to open a road from Assab to the mountains.

— The section of the Meuse of the Société de géographie de l'est (France) will open a geographic and ethnographic exhibition at Bar-le-Duc, Aug. 20 to Sept. 20, 1883. Besides maps and collections from foreign countries, the exhibit is to contain special studies of the geography of the Meuse; and prizes are offered for the best monographic descriptions of the several communes.

— The Michigan mutual life-insurance company has published a report on the mortuary experience of the company from its organization to Jan. 1, 1882. The methods employed in making their experience-tables is described in detail by the actuary, Mr. M. W. Harrington. It should be noticed, however, that the results make a very favorable showing for the company, possibly due to its comparative youth.

— A. Penck's 'Vergletscherung der deutschen alpen' is carefully reviewed by F. v. Richthofen (*Verh. erdk. Berl.*, 1882, 565–577).

— J. E. Sherrill of the Normal publishing house, Danville, Ind., has in press, for immediate issue, 'Scientific orthography and orthoepy,' by Professor Isaac W. Clinger, Normal school, Charleston, W. Va.

— The Russian department of public works will this year begin the construction of a canal between branches of the Obi and Yenissei, which will, when completed, give water communication from Tumen, near the Ural Mountains, to Kiakta, beyond Baikal, on the Chinese frontier, a distance of more than 1,500 miles in a direct line. Navigation on part of this route lasts only four months.

— The Società geografica italiana has lately issued a volume of notices and proceedings (*notizie e rendiconti*) of the third international geographical congress, held at Venice in September, 1881. A considerable number of pages is occupied with formal addresses, lists of members, awards, and other statistical matters. The reports on certain questions presented to the congress include material of more permanent interest. Among these may be mentioned that of A. Ferrero, recommending the measurement of southern meridian arcs in Australia and the Argentine Republic; Schiaparelli's report on local deflections of gravity, causing differences between astronomical and geodetic latitudes, in one case, near the Alps, between Andrate and Mondovi, amounting to 47″, or one per cent of the total amplitude (singularly enough, the Apennines, in some cases, cause the geodetic to exceed the astronomical latitude); the successful application of photography to topographic work, by Paganini; Magnaghi's hydrographic report, recognizing the superiority of wire-sounding apparatus, and including a classified list of coasts sufficiently or imperfectly surveyed; Uzielli's recommendation of careful measurements to determine horizontal or vertical changes in the relative position of certain points on the land, the causes of such change being found in variations of internal and external pressures in the earth, in contraction of the globe from cooling, in the daily and yearly oscillations from solar heat, shown by Plantamour and Hirsch, in change of composition and density of rocks, and in the underground effects of water. Polar meteorology, ethnography, commercial and historic geography, are also considered. In the geographic exhibition, Italy naturally filled the greatest space; France, Russia, and Germany following it. The objects exhibited numbered 7,042, exceeding those of the Paris geographic exhibition of 1875 by 40 per cent.

The proceedings of the several sectional meetings contain discussions on numerous topics: such as, Egyptian climate, Abbate and Mahmoud Beys contending that there were no signs of its having changed within the past twelve centuries; the formation of coral-reefs by other means than subsidence, as suggested by Semper and Murray, and here maintained by Rein and Fischer; the definition and limitation of scientific geography to the study of the form of the earth's surface, including the manifestations and reciprocal relations of organic forms, with the aid, where necessary, of other sciences, its distinguishing characteristics being the study of position and distribution; the advisability of representing mountain relief and oceanic depression in school-atlases by contour-lines and shades of color rather than by hachures; the exploration of the Mediterranean by Magnaghi and Giglioli, on the 'Washington,' in 1881, their results about Sicily and Sardinia showing a greater variety in the bottom fauna than had been previously found, and an almost uniform temperature of 13.5° to 13° C. at all depths from 800 to 3,634 metres. Three maps are published in this volume. One shows the position of meridian arcs, measured up to 1865, for geodetic purposes (the arc in southern Africa seems accidentally omitted). Another gives the primary triangulation of Europe, showing a wonderful network of accurately determined lines. This, taken with the maps given in our coast-survey reports, and the map of Indian triangulation, reproduced in Markham's 'Indian surveys,' will show about all that has yet been accomplished in this direction. A third plate shows the route of the 'Washington' in 1881. A second volume of acts and communications is promised, in which more extended and valuable reports of scientific papers will be published.

— American entomologists will regret to learn the sudden death of Prof. P. C. Zeller, by heart-disease, at his residence in Grünhof, near Stettin, Prussia, on the 27th of March. He has been known for many decades for his excellent systematic work on Lepidoptera, especially the lower groups, and of late years has contributed memoirs of importance on American forms. He died at the age of seventy-five, and was actively engaged in his favorite studies to the last.

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